

POPULAR MECHANICS MAGAZINE



FIAT STATION WAGON
—the Shape of Cars to Come?
Page 84

COUNTDOWN REPORT FROM CANAVERAL



HOW GOOD ARE THE PRESTIGE CARS?
Report on CADILLAC, IMPERIAL, LINCOLN

For the Craftsman



**no drag
on the rag**

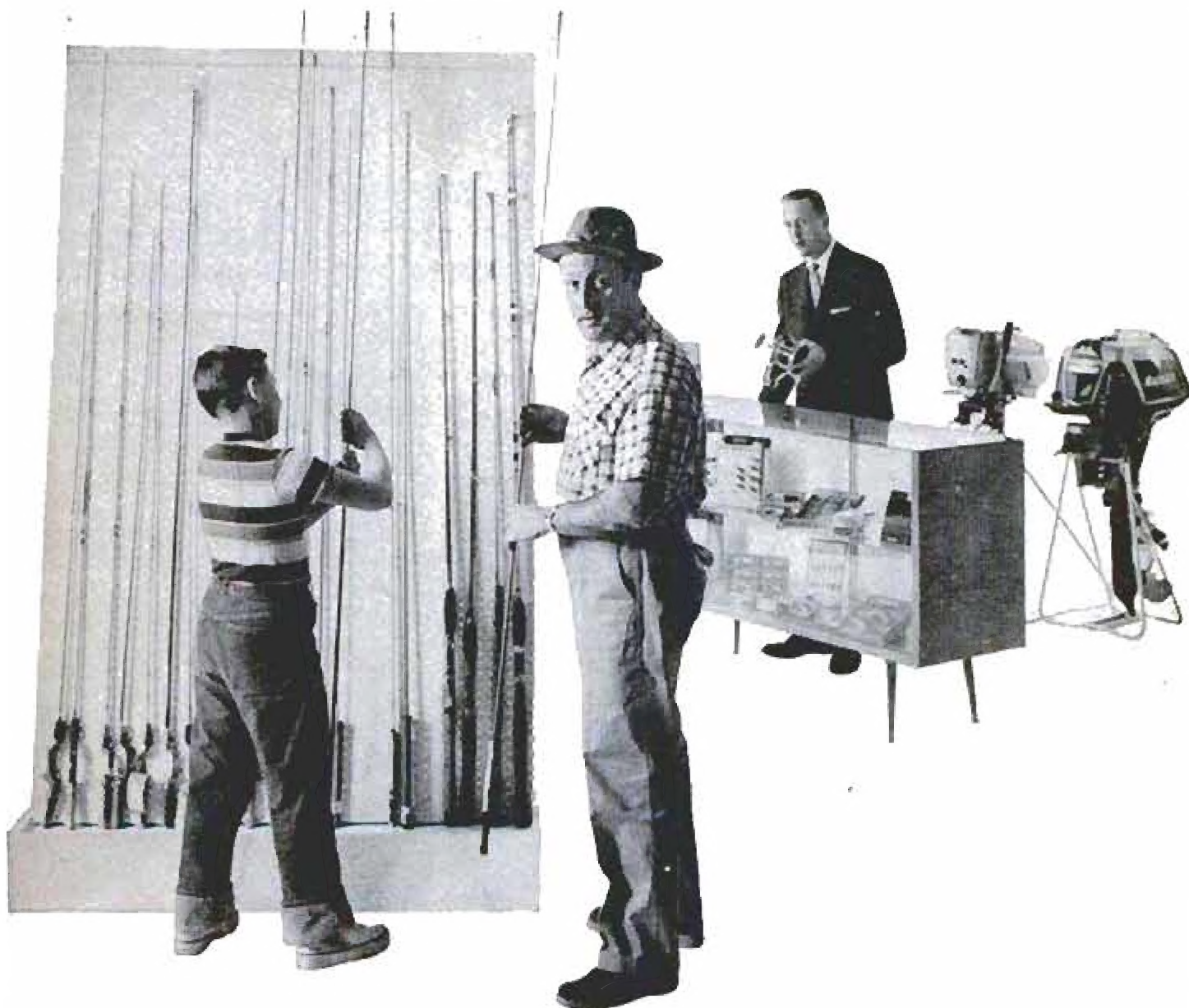


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You need special spark plugs, too

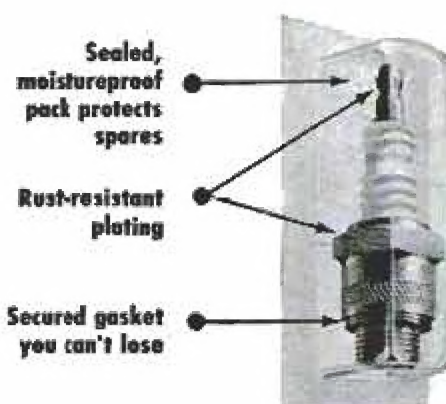
Always use the spark plugs specially designed for outboards— **CHAMPIONS!**

Just as you get the best results with the right rod, you get the best performance from your outboard with the right spark plugs. *Champion marine spark plugs.*

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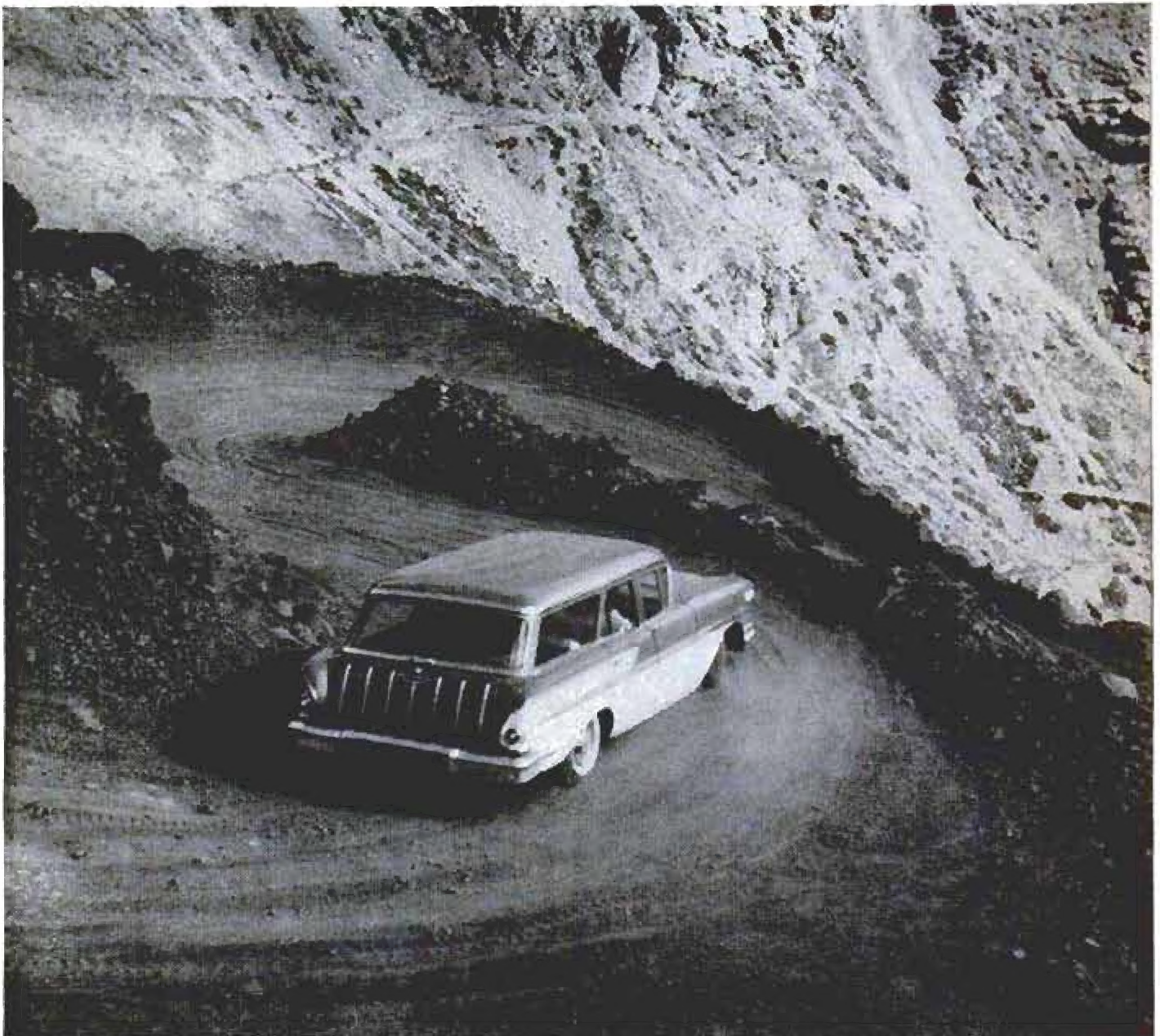
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Chevrolet Division of General Motors, Detroit 2, Michigan.



Corkscrew turns furnished convincing test of Full Coil stability, were no strain even for 98-pound girl co-driver.

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Volume 110

JULY 1958

Number 1

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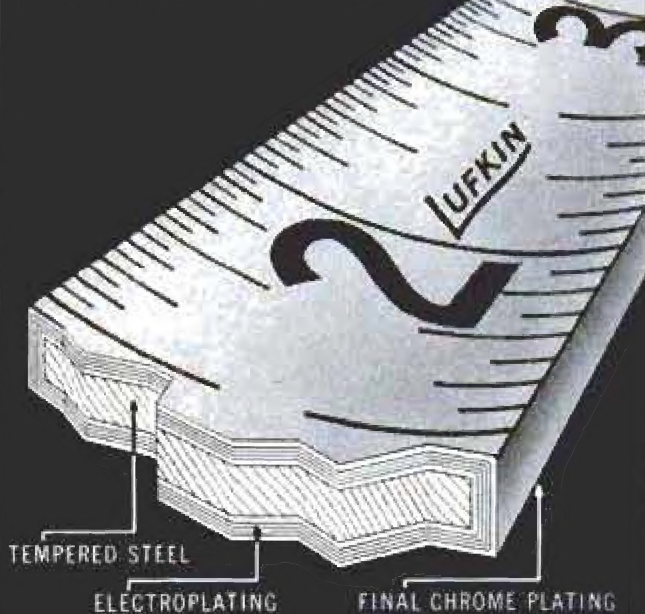
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Next Month...

LOOK FOR A BIG "double feature" in your August Popular Mechanics — not one, but two reports from owners on their automobile likes and dislikes. With rumors going the rounds that American auto manufacturers will be introducing small cars in 1960 to compete with the European imports, we decided to give you a close look next month at the two makes that can be considered America's only current entries in the "economy size" category — the Rambler American and the Studebaker Scotsman. The owners of these two cars will tell you whether they think Rambler and Studebaker meet the challenge of the economy packages coming from Europe.

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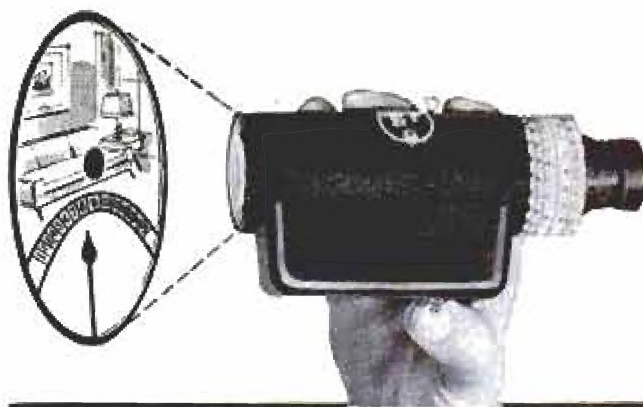


Photo Exposure Meter Pinpoints Light Readings

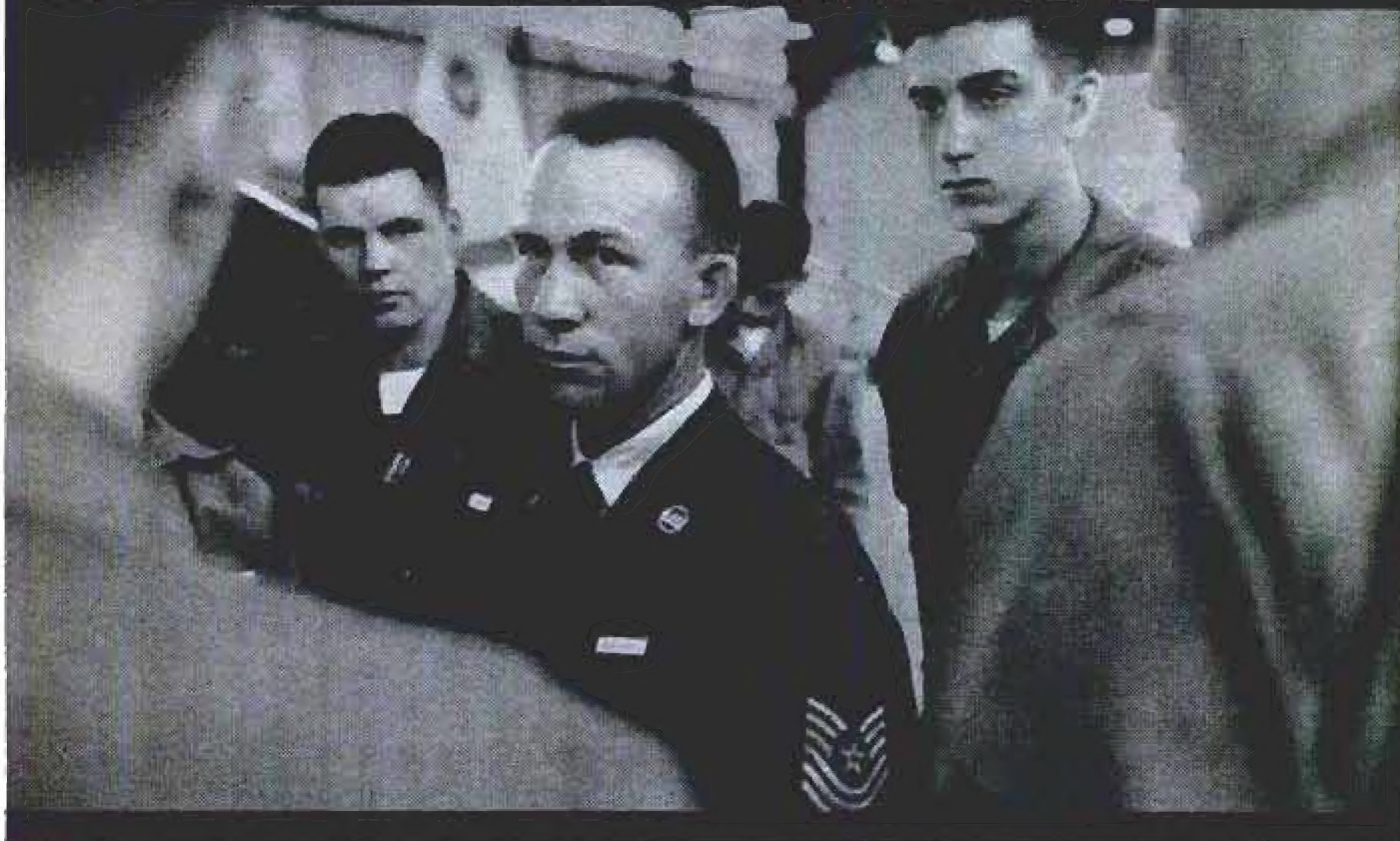
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ACROSS THE DESK



Correction for "Swish" Builders:

Builders of "Swish," a 15-ft. sports outboard presented in our March 1958 issue, will need a 16-ft. length of plywood for the bottom planking. The 14-ft. length given in the material list is not long enough. We regret the material list as provided by the designer was in error.

☆ ☆ ☆

Over 23 Miles Per Minute!

Keeping up with the flying records? It's not so easy, with altitude and speed records being broken oftener than the four-minute mile on the cinder paths. Latest phenomenal mark reported is the new speed mark



set by a USAF Lockheed F-104A Starfighter which flew 1404.9 miles per hour, more than twice the speed of sound, over a measuring course above Edwards Air Force Base in California. Capt. Walter W. Irwin was the pilot. Previous record was 1207.6 miles per hour set by a McDonnell F-101A Voodoo. The Starfighter's record, when broken down, comes out at about 23.4 miles per minute, or close to 0.4 mile per second.

☆ ☆ ☆


Letter to Arthur R. Railton, Automotive Editor:

Dear Art:


I read with interest your "Detroit Listening Post" in May *Popular Mechanics*. You caught my viewpoint except for one thing.

You indicate that it is my view that cars are too long but "not too low." When you asked me about the height of cars, I thought I made it clear that I did not feel that our cars were too low. If you check the figures, you will see that our Rambler cars have adequate height for good headroom. On the other hand, I think some cars are getting too low.

(Continued to page 8)




GOOD SALARY




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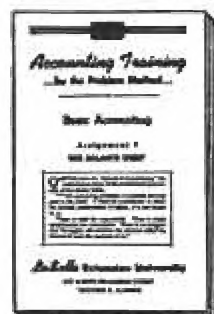
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(Continued from page 6)

Otherwise, I find your article very interesting and accurately reflecting our conversation.

George Romney, President,
American Motors Corporation,
Detroit, Mich.

☆ ☆ ☆

To the Editor:

Away up in northern Queensland there lies an area of thousands of square miles, sparsely populated, which depends for its contact with the outside world on a rather elderly rail motor and a lonely 3-foot 6-inch



track. R.M.32, as it is known officially, or more affectionately "Endeavor," runs a weekly service all year—interrupted a few times in the "wet."

The track runs from Normanton to Croydon, 94 miles, and is carried on steel sleepers (ties) to discourage termites. The trip takes between four and five hours. As the steel sleepers rust away they are replaced by wooden sleepers treated to resist white ants (termites are always called white ants in Australia—they are called other names too, but we won't go into that).

Brian Gibbs, whose correct title is "officer in charge, Normanton Railways" is the driver, engineer and guard when the train is in motion; he is also stationmaster at Normanton and Croydon, also paymaster to himself, one porter, one ganger and five fettlers, who keep the track in good order; he is also the goods clerk, so he has a pretty busy time.

P. T. Horton,
Fullerton,
South Australia.

☆ ☆ ☆

To the Editor:

I am the owner, financier and designer of the first (and only) all-Ford diesel passenger car.

(Continued to page 10)



Petroleum engineer with a tough hair problem. John Doles spends his days on an oil rig off Louisiana's Gulf Coast. He's outdoors a lot, and sun and wind punish his hair.



He licks it with Vitalis. Vitalis gets John's hair in condition for important occasions—like taking his wife out dancing. His hair never looks messy, thanks to greaseless V-7.

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(Continued from page 8)

My 1955 Special Ford diesel car has 12,000 miles on it and the engine hasn't even been tuned up as yet. The Ford diesel engine is a four-stroke, four-cylinder, 16-to-1-compression-ratio job with a 3.22-to-1 rear axle. It has no fan at all, having automatic radiator shutters instead.

It has a 1950 Mercury overdrive transmission, a hydraulically operated truck clutch. Car weighs 3600 pounds. Engine is governed at 2400 r.p.m. or 100 m.p.h.!

No starting aids of any type are required. Starts on its own fuel regardless of weather. Average economy is from 42 to 48 miles per gallon. In city, it's 25 to 30 miles per gallon.

I get more than 55 miles per gallon at constant speed over a measured mile. I change oil and filter only every 8000 miles.

I can't understand why Ford Motor Company will not build a diesel passenger car. If it did, it would take the market by storm.

I expect to get 500,000 miles before a major overhaul. And, what's more, exhaust fumes are nonpoisonous.

It's no noisier than a lot of the new cars and I can always redesign the combustion chamber to deaden what noise there is.

Norman K. Shaw,
Dayton, Ohio.

☆ ☆ ☆

To the Editor:

Thank you for the copy of your (May) issue. This ("Stand By for Major Earthquake!") is a very good article; it states the essential facts in a serious situation with reasonable accuracy and no undue sensationalism. It contrasts favorably with the "scare" article published in one of the popular magazines about a year ago. Your illustrator has also done a good job. I was entertained by the use of the celebrated Nevada photograph with its hilarious detail at the left.

C. F. Richter,
Professor of Seismology,
California Institute of Technology,
Pasadena, Calif.

☆ ☆ ☆

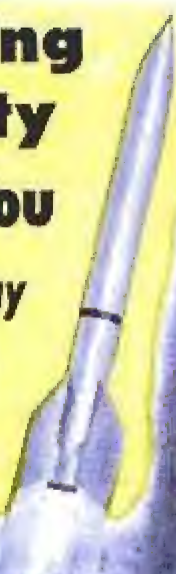
To the Editor:

Thank you very much for your courtesy in sending me a copy of the (March) issue containing the cloud pictures and text by Eric Sloane. I have followed Mr. Sloane's work for some years and have always enjoyed his art. Some of his cloud paintings are really masterpieces. You are to be congratulated for bringing this useful material before your readers.

H. E. Landsberg,
Director, Office of Climatology,
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Washington, D. C.

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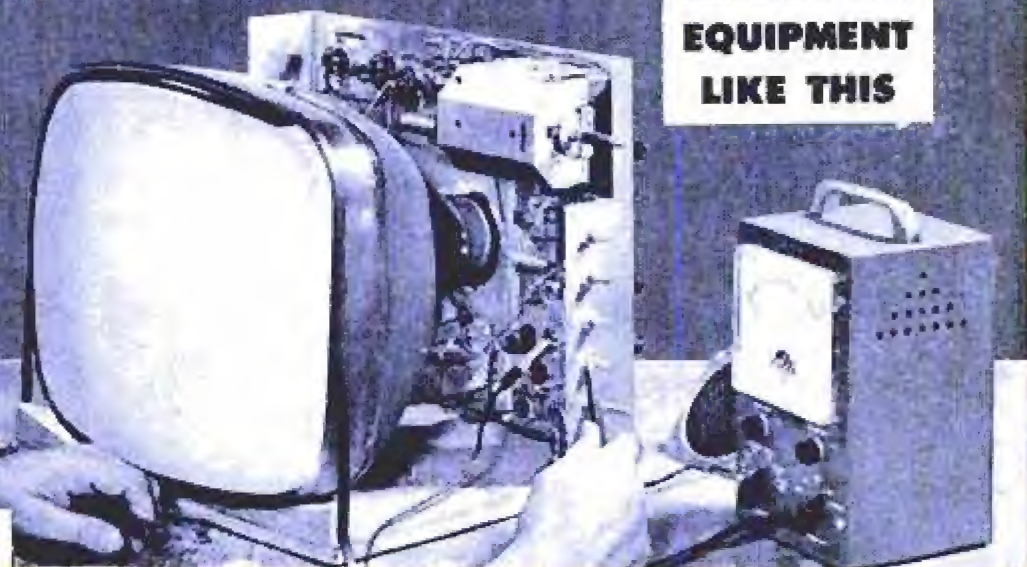
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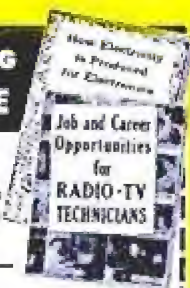
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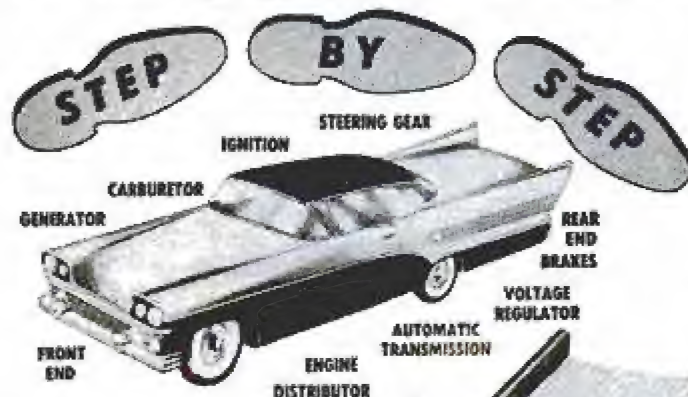
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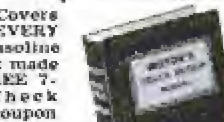
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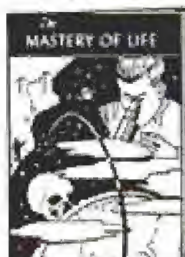
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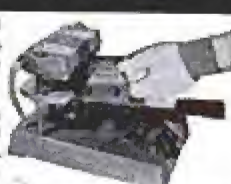
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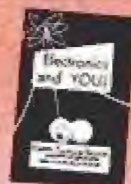
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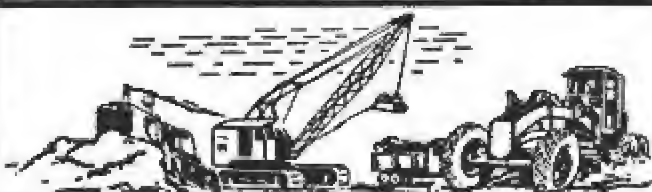
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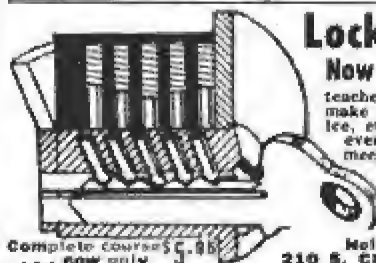
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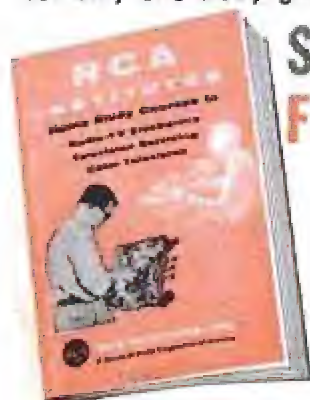
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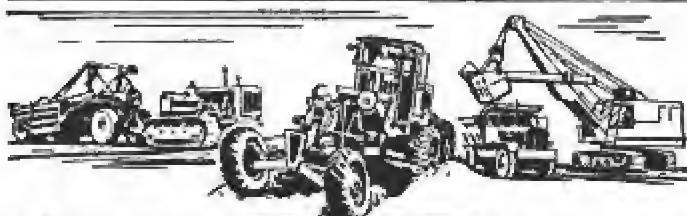
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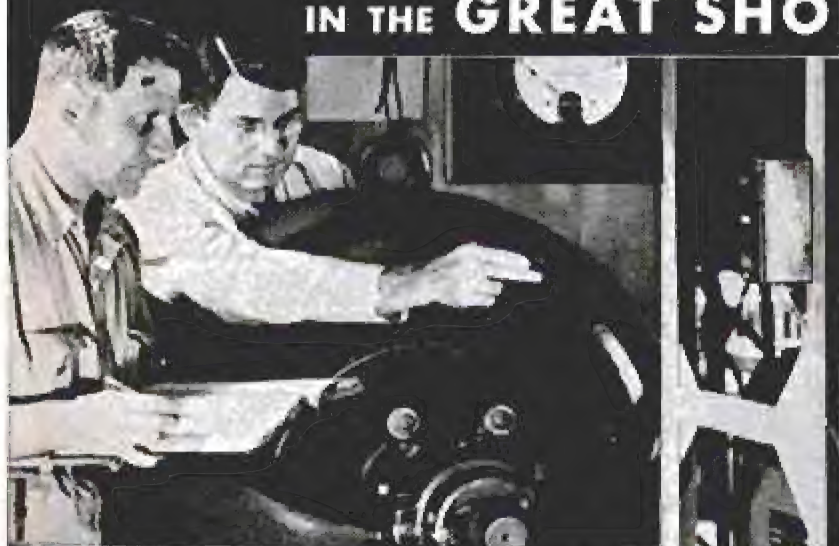
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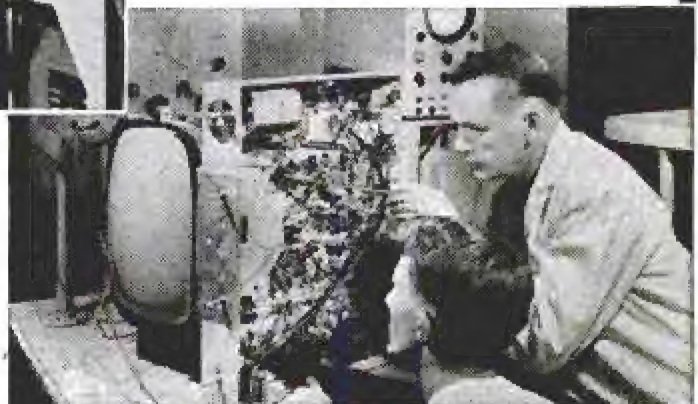
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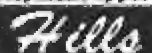
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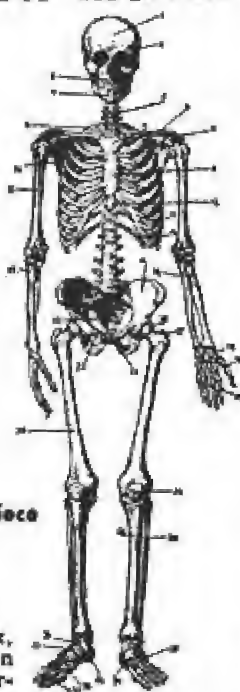
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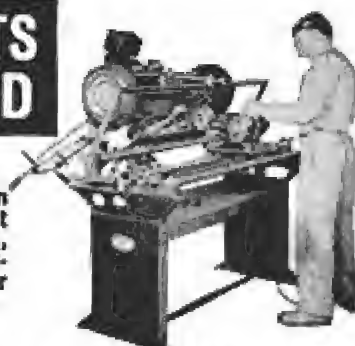
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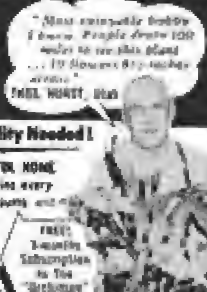
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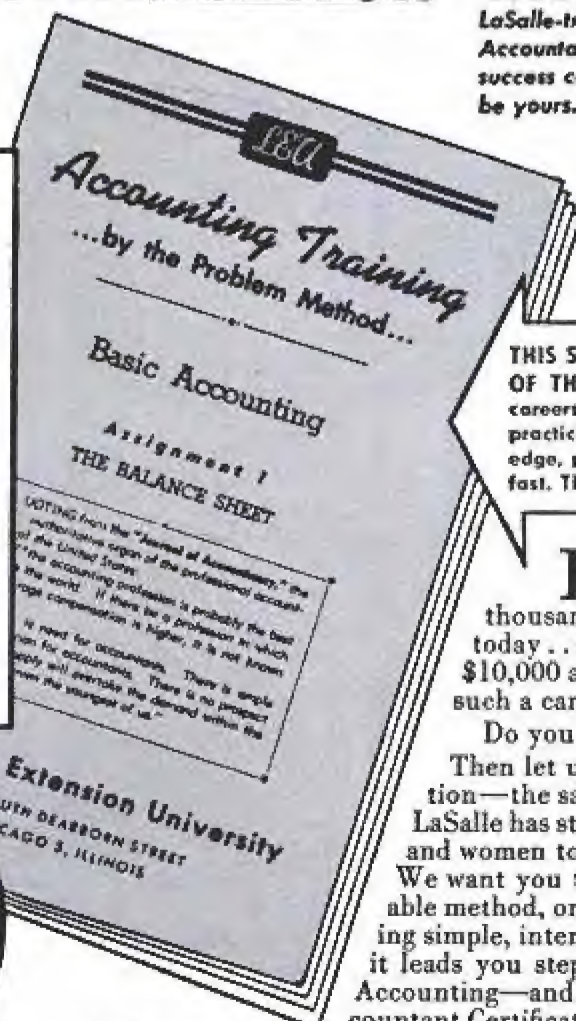
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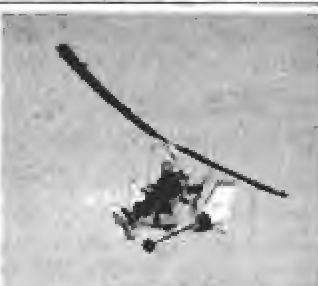
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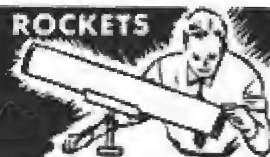
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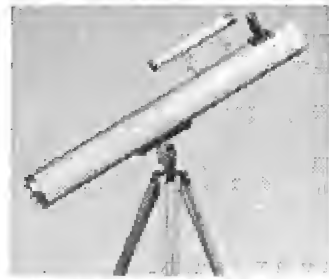
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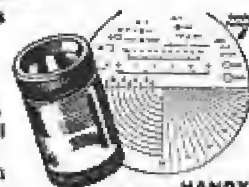
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OIL Colored 8x10 enlargement complete with never tarnish gold metal frame from any negative, snapshot, or old photo, only \$2.95 work guaranteed. Ambrose Studio, 623 Smithfield Street, Desk 10, Pittsburgh, Pennsylvania.

100 PHOTO Stamps \$1.00. Send negative or picture. 8 jumbo including 4x5 size 28¢. Limit 4 rolls. Box 44815, Los Angeles 44.

FILMS Developed—Complete color and black and white service. New low prices. Best quality, fast service. Write for free mailers and price lists. Photo Mail, Box 216-B, Madison Square Sta., New York City 10.

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KODACHROME Processing by Kodak. 8mm. roll or 35mm., 20 exp., \$1.35. Prompt service. Write for mailers and prices. Color Pix, Dept. P, CPO Box 30, Kingston, N. Y.

TWELVE Exposure rolls 39¢. Wallets 20 for \$1.00. Lincoln Studios, Dept. K, Box 13, Lincoln, Nebr.

8-HOUR Service on deluxe jumbo prints. 8-exposure roll developed and 8 jumbo prints 40c, 12 exposure 55c, 16 exposure 70c, 35mm, 20 exposure 75c, 36 exposure \$1.25. Jumbo deckle reprints 4c each. Contact prints made if specified. Bay Photo Service, P.O. Box 210, Oakland, California.

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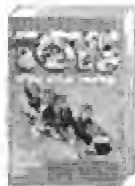
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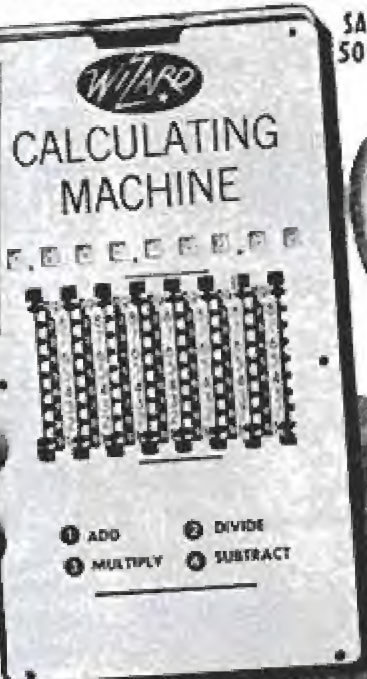
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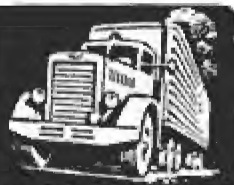
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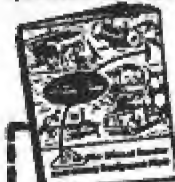
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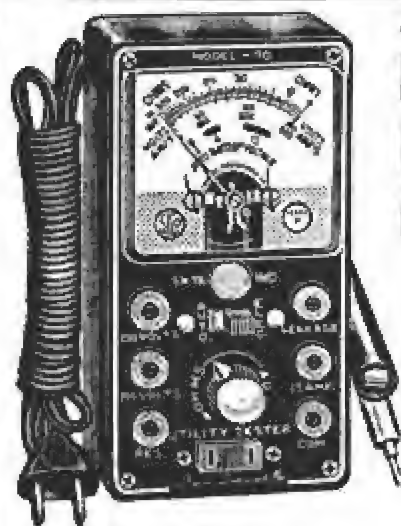
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NOTICE—It is the intention of this magazine to provide its readers with information regarding the latest developments in the mechanical arts. Except where otherwise indicated, this magazine has no information as to any unexpired patents in respect of the developments reported herein. In the event that commercial use is to be made of any of the developments reported herein, it is suggested that legal counsel be consulted to avoid liability for patent infringement. It is not the purpose of this magazine to encourage patent infringement but, as indicated, it is the intention of this magazine to report on the latest developments in the mechanical arts.

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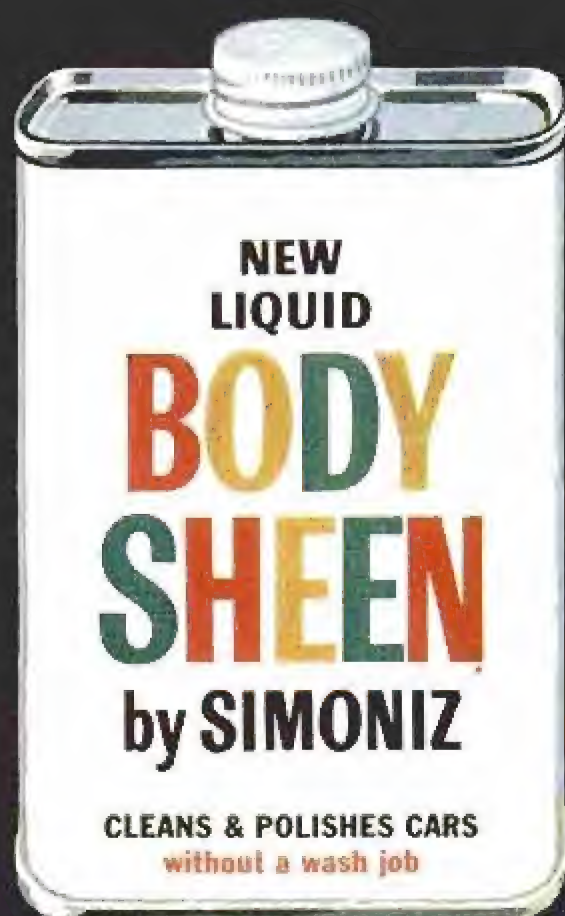


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Meet LITHIUM: The Stuff of H-Bombs— and Milady's Powder

By Clifford B. Hicks

CHANCES ARE you've never even heard of a substance called Li-6. Most people haven't. But then most people hadn't heard of a substance called U-235 until an A-bomb flashed over Hiroshima in 1945. In the near future, Li-6 could just possibly be even more explosive in its impact on history than U-235.

What is Li-6?

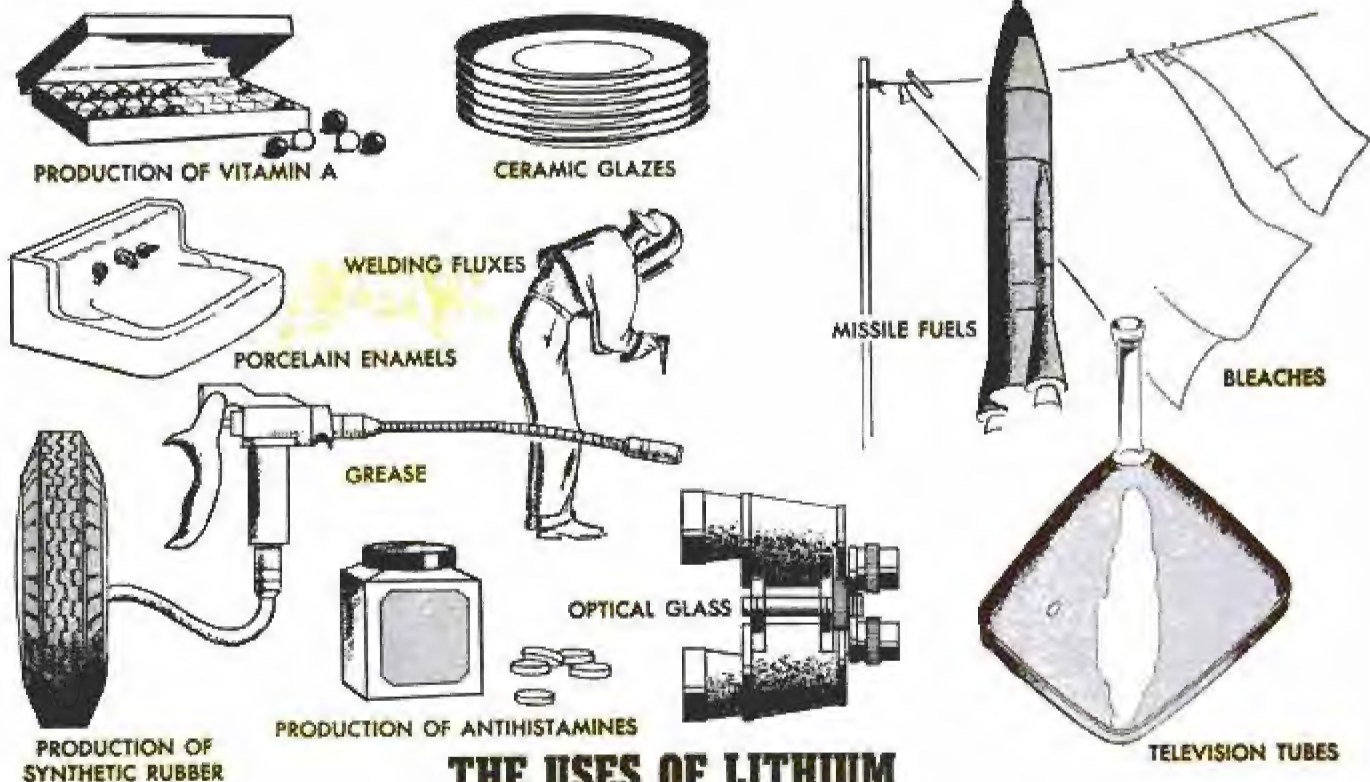
Li is the chemical symbol for lithium, an alkali metal which is the lightest of all solid elements. Until recently, lithium was looked on as the poor cousin of the other alkali metals, a ne'er-do-well actor who never would amount to much. Instead of the poor cousin, lithium may turn out to be the rich uncle who turns up unexpectedly to solve the family's problems.

Li-6 is one facet of lithium's personality. It is one of the natural isotopes of the element, just as U-235 is one form of uranium. There's a cloud of secrecy around the H-bomb, but a good guess is that the material in that bomb started out as Li-6. Further-



more, if current projects are successful in taming the H-bomb, Li-6 may play a key role in the fusion reactor.

Lithium not only is one of the key elements in nuclear science, but is solving problems in other fields. In this country we



THE USES OF LITHIUM

are using 10 times as much lithium as we did just five years ago. You use it countless times each day without recognizing it. Probably your car is lubricated with lithium grease. The vitamin A you take in the morning is manufactured with the aid of a lithium chemical. You may eat your dinner off a plate glazed with lithium and take your bath in a tub coated with lithium enamel. When you watch TV you're looking into lithium glass.

Yet who ever heard of lithium? Perhaps you bumped into it in high-school or col-

In its pure form, lithium is silvery white, floats in water and can be cut easily with a pocket knife

lege chemistry, but even here it was skimmed over in the last five minutes of a class period devoted to more "important" elements. Now the rich uncle, dressed in a cutaway coat, has come home to join the family.

Lithium Floats in Water

The fine clothes are there. In its pure metallic form lithium is a beautiful silver-white. It weighs only one fifth as much as aluminum. In water it floats like a cork, and you can cut it easily with a knife. Upon exposure to air, its beautiful surface tarnishes quickly.

In most crowds this gent is an excellent mixer. Drop lithium in water and it reacts slowly to release hydrogen. Ignite it in air and it burns. Expose it to numerous gases and it reacts to form stable compounds. In fact, lithium is so friendly, it makes an excellent scavenger for use in metallurgy: Stir up an alloy recipe, add a pinch of lithium metal and the lithium will react with contaminants to remove them from the soup. Lithium is not nearly as short-tempered as the other alkali metals, which are notorious for their explosive personalities. The element has a comparatively high melting point and the longest molten range of any of the alkali metals.

And lithium, once spurned, may return to the family bearing vast power. Li-6, when bombarded with neutrons, gives up tritium. This rare triple-weight hydrogen probably is the stuff from which H-bombs are made. The eminent physicist Hans Thirring has stated that fusion can be maintained only with Li-6. One guess is that the H-bomb consists of a small A-





Vast deposit of lithium-bearing ore occurs in North Carolina, where boulders simply are scooped from ground

bomb (to initiate the reaction) surrounded by a thick layer of Li-6 deuteride. Touch off the A-bomb in the center and you get an explosion of stellar proportions.

Thus this star lightweight seems destined to occupy the center of the stage, not only for its role in nuclear energy but for its use in humdrum, everyday products. Why haven't we had its benefits for decades?

We have, but the uses were restricted. Lithium is the Rip van Winkle of metals. Johann August Arvedson discovered the element in 1817, but it remained strictly a laboratory curiosity until the 1880s, when

one of its compounds, lithium hydroxide, was used to boost the efficiency of Edison storage batteries. Somewhat similar batteries powered submarines in World War I. Through the next several years it found its way into carbonated drinks (it provided the tingly flavor) and in its carbonate form as an ingredient for porcelain-enamel coatings—still its biggest use. It lowers the melting point of these enamels, making them flow more easily and permitting them to be fired at lower temperatures.

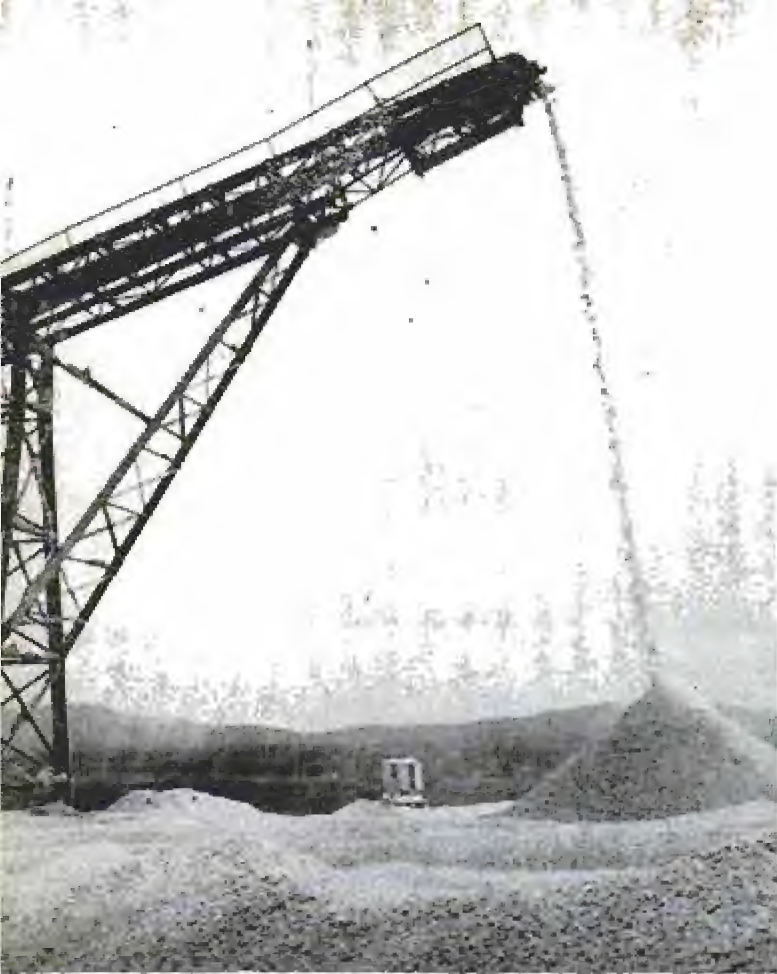
Workman adjusts feed chute which carries crushed ore to an industrial plant for lithium extraction

Foots Mineral Company photos



Diagrams show one possible design of the H-bomb. Above, blanket of Li-6 surrounds a small A-bomb. Below, when the A-bomb explodes, neutrons bombard Li-6 to produce tritium, causing stellar explosion





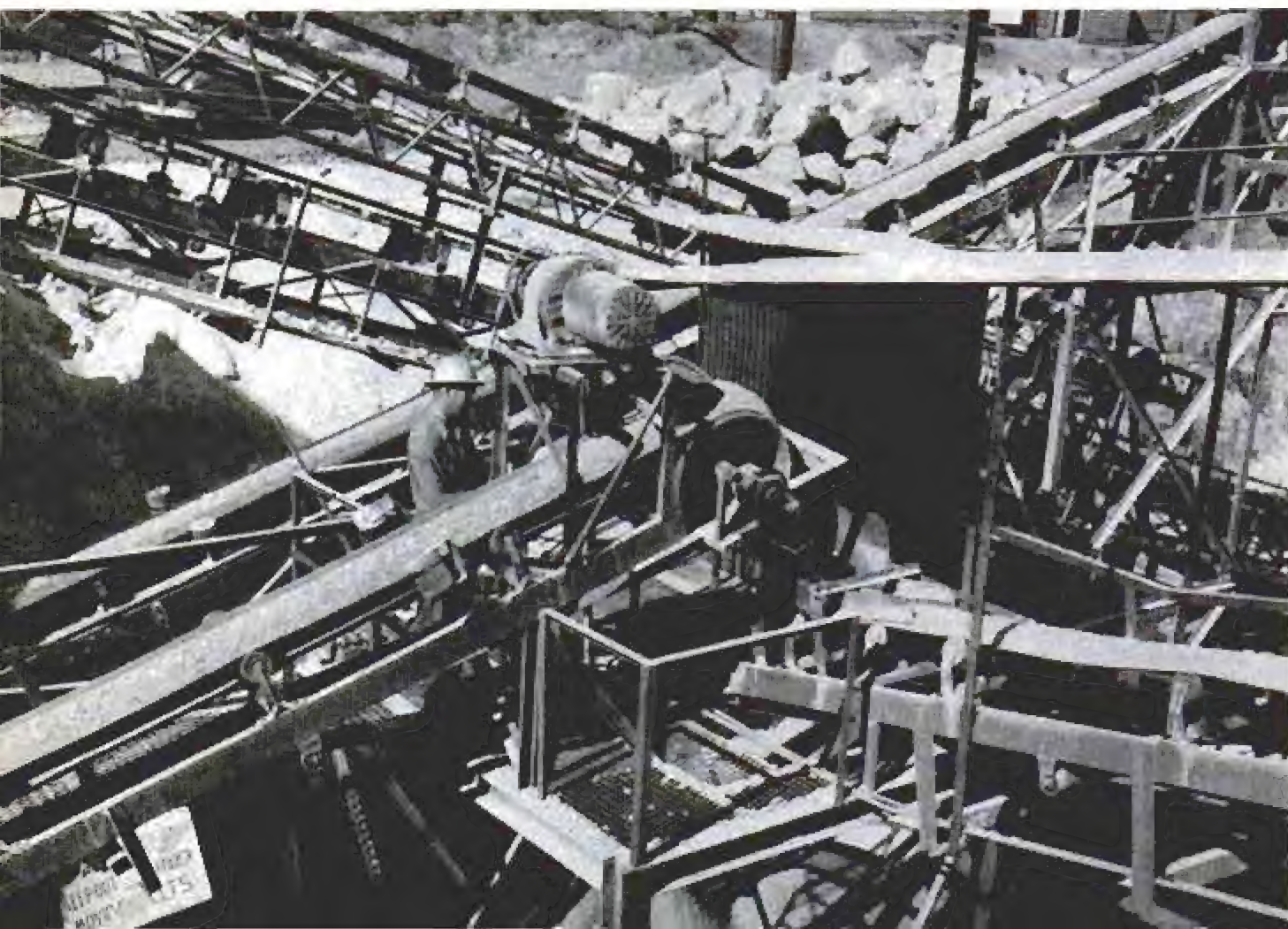
After the ore is mined in the form of huge boulders, it goes to a rock crusher. Pounded into gravel, it flows up a feed chute which drops it in a huge pile. Ore then is ready for shipment to processing plant

Lithium Proved Einstein's Theory

Then in 1931 a few atoms of lithium became the most important atoms in the world, though only the physicists recognized this at the time. Years before, Einstein in his classic equation had suggested that energy and mass are the same. In 1931, two physicists, Cockcroft and Walton, bombarded lithium with protons and found that alpha particles were ejected with tremendous energies. This energy, they found, was equivalent to the decrease in total mass. This was the first concrete evidence to support Einstein's theory and the first indication that energies of staggering magnitude could be released from the atom, a fact conclusively proved to the world 14 years later at Hiroshima. Thus lithium not only is the star of the nuclear drama, but helped draw the curtain.

In 1933, shortly after the Cockcroft and Walton experiment, a small firm in Philadelphia began producing lithium in an earthenware crock. Foote Mineral Company had once been in the business of supplying mineral specimens to collectors, and gradually had worked into the industrial field, supplying small quantities of little-known minerals, chemicals and metals. Virtually no one wanted lithium at that time, but Foote started turning out small batches anyway.

Vast and puzzling array of moving belts carries ore in various stages of treatment throughout the plant



Today those batches have grown into freight-car loads and Foote is one of the three giants in the business. The others are American Potash and Chemical Corporation, and Lithium Corporation of America. Maywood Chemical Works is a smaller producer. All told, these firms turn out only about 100 tons of the pure metal per year, but they provide numerous lithium compounds in huge batches to anyone who wants to buy.

AEC Is Biggest Buyer

By far the biggest buyer is the Atomic Energy Commission, which recently signed a contract with the three major suppliers to take all the lithium hydroxide they can turn out. Certainly it is one of the strangest contracts ever drawn, for in effect it is based on a difference in the number of neutrons in lithium atoms.

Lithium in nature occurs as a combination of two stable isotopes, Li-6 and Li-7 (the latter has one more neutron). Less than 10 percent of all lithium is Li-6. These are the particular atoms the AEC wants, and it has no known use for the others. But only the AEC can sort out the atoms, so it has to buy both types.

Method Is Secret But Easy

Though the separation method is secret, it would appear to be as easy as sorting golf balls from marbles compared to the incredibly difficult task of separating U-235 from U-238. In any event, once the atoms have been separated into two piles, the AEC has on hand a huge stack of Li-7 for which it has absolutely no use. According to the terms of the contract, only the original supplier can buy back this Li-7. Such a supplier then resells the material to anyone who wants it.

Everyone Wants It

And many want it. It is this Li-7 that goes into the greases and TV tubes, the air conditioners and soft drinks. Lithium greases permit vehicles to operate in temperatures ranging from an icy minus-60 degrees to a scorching 130. In air conditioners, lithium chloride wrings water out of the air. Milady puts on lithium stearate when she covers her cheeks with face cream. Lithium compounds are used in bleaches and welding fluxes. They play a part in the production of antihistamines, vitamin A and synthetic rubber.

Other lithium compounds, according to Foote research, show great promise as friends of the farmer. Lithium apparently makes some plants resistant to fungi and therefore resistant to disease. Evidence shows that it may control wheat rust, early blight in celery, and tomato galling. Lithium compounds do their work through the soil. When the plant assimilates a certain quantity of lithium, it resists the blight.

Lithium for Missile Fuels

It's a good guess that lithium is also under test in two other booming fields. Missile fuels must have two things: The fuel itself and oxygen. Lithium compounds have a much higher oxygen content per weight than most other chemicals. Also, molten lithium metal would appear to be an excellent heat-transfer medium in nuclear reactors. The one drawback here is that at high temperatures lithium becomes extremely corrosive.

With all these uses, it's apparent that more and more lithium will be needed. What about the supply?

Lithium occurs throughout the world, but there's such a small amount in most ores that it can't be profitably separated. However, rich deposits are scattered around the world, and there seems to be

(Continued to page 232)

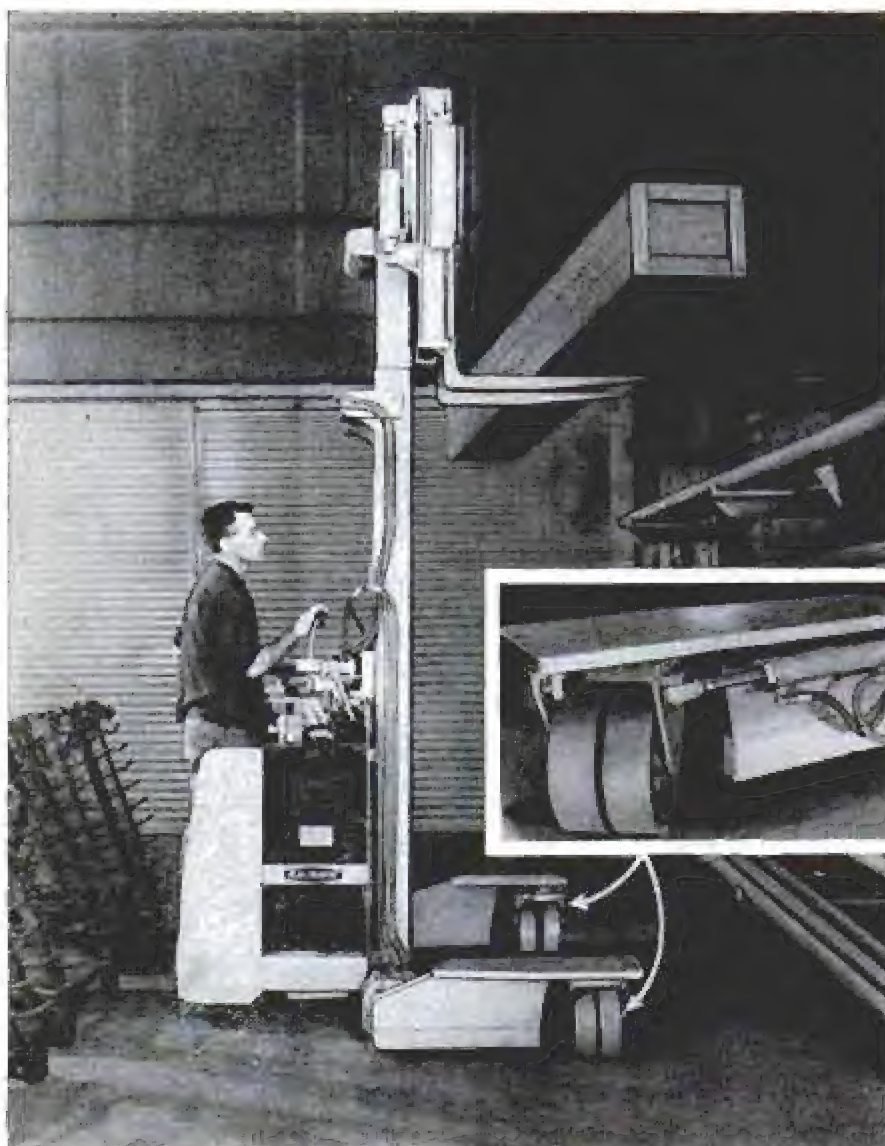
Workman removes cakes of lithium concentrate from filters
American Potash & Chemical Corp. photo





Hi-Fi Phonograph Built Into Organ

Music lovers with limited space can buy an electronic organ with a built-in high-fidelity phonograph system. The instrument includes an amplifier, woofer-tweeter speaker system with cross-over network, sound baffle and an automatic four-speed record changer. Records of organ instruction give the instrument a "built in" teacher. The phonograph and organ may be played separately or together. By using a headset, a person can either practice on the organ, play the phonograph or operate both together without anyone else in the room hearing the music.



Forklift Truck Moves Four Ways

Designed to travel horizontally in four directions — forward, backward, left and right — a new forklift truck can transport long loads down aisles as narrow as seven feet. Its right load wheel is hydraulically adjustable for forward or backward travel and can be turned 90 degrees for side movements. The other wheel is a free-swiveling caster. Capacity of the truck is 4000 pounds.

Tree Mortality Rate Improves

For the first time in this century, America is growing trees faster than they are being removed by harvest and killed by fire, insects and disease.

Ⓐ synthetic rubber plant is being built in Japan with Goodyear Tire & Rubber Company assisting in design, construction and operation.

AN EDITOR REPORTS from CANAVERAL

By Richard F. Dempewolff

IMAGINE A SHOOTING range 5000 miles long and you get some idea of the purpose and extent of "Canaveral," popular name for the Air Force Missile Test Center at Cocoa Beach, Fla. Here, on 15,000 acres of sand and swamp, gantry cranes rear against the seaward horizon like oil derricks on a prairie. Clutched in the steel web of these rigs—some of them 12 stories high—the big "birds" of this country's missile arsenal are continually being readied for zero hour when, with earthshaking roars, they bore spaceward. On a string of islands stretching from Cuba through the Bahamas and off the coast of South America, technicians manning 10 stations track and listen to every pulse of the birds in flight. Beyond the island chain, six picket ships, bulging with white radomes and sprouting coiled antennas, take over and track the vehicles to their watery finish. According to Maj. Gen. Donald N. Yates, boss of this "world of tomorrow," plans call for three more of the 350-ton vessels to extend the range nearly to the coast of Africa.

Cape Is Just a "Gun Rest"

The Cape itself is merely the "gun rest" for the vast shooting gallery. Except for a brief series of press tours when the Test Center opened in 1951, no one has been allowed to poke his nose inside the cyclone fences without specific security clearance. Just recently, writers and photographers from a group of newspapers and magazines, including *Popular Mechanics*, were finally invited to look inside. They climbed the test stands, investigated launching pads, saw missiles in preparation for launching and prowled through the electronic mazes of igloo-shaped blockhouses.

Crossing the drab palmetto flats which the test center's security officer claims harbor enough rattlesnakes, cottonmouths and alligators to provide a natural security barrier, you see on the Cape's northern shore six skeletal towers under construction. These are the massive towers for Titan—our biggest ICBM—which soon will be test flown. To the right are the Atlas launching pads. Then come areas for intermediate-range missiles such as Thor and Jupiter. On the southern shore lie the hangars and weird take-off rigs for winged missiles such as Bomarc, Snark and Matador.

It takes 14,000 men to run this big "bird

nest." A launching site is not just a concrete pad and a gantry crane. It is a vast area of intermeshed mechanical and electronic equipment, linking not only the parts of the immediate site but also the down-range stations. You hear the men talking about the "Thor Complex," the "Atlas Complex," the "Azusa Complex." In fact, the whole place has a language of its own. Out on the complexes, hard-hatted men in foil suits (to protect them from acids and liquid oxygen) chatter like men from another world. You learn that a "squib" is a gadget used to fire the igniter in a rocket; "throat" is the constricted section of the exhaust nozzle in a rocket engine. "Egads" is not an exclamation, but electronic timing devices that select for a missile the proper ground transmitter which can most effectively "illuminate" the missile as it goes. The odd word comes from the gadget's actual but unwieldy name—"electronic ground automatic destruct sequencer." Similarly, "dovap" is the popular handle for a system of transmitting and receiving stations known as "Doppler velocity and position." The trailer on which a rocket comes to the pad is a "Mellerwagon" and the instant of rocket launch is "T-time."

Awesome First Impression

First impression to strike the visitor at any launching site is the awesome size of everything. Out on the Thor Complex massive test stands for this 75-foot monster look like steel frames for four-story office buildings. Clamped over the flame bucket, the rocket spouts an inferno down over a steel scoop resembling a bulldozer blade some 40 feet wide. During such static tests, waterfalls cascade at a rate of 15,000 gallons per minute down the curved steel plate to keep it from burning up.

Project officers on the Thor Complex say that this big baby, though designed for 1500-mile range, has already flown 2500 in tests, and can be made ready for launching in from 2 to 15 minutes. Soon to be made operational (possibly by the end of the year), the Thor needs only a slab of concrete in order to be fired. "There is an elaborate national highway system already being worked out," one Thor crewman points out, "which will provide tens of thousands of possible launching sites for this liquid-fueled rocket."

Contrary to the popular belief that

liquid-fueled rockets require days of preparation and hours of countdown, General Yates reveals that once operational, these monsters will be highly mobile. "Any of the tactical missiles can be filled by pressured fuel injection right now," he says. "They can be held in a state of readiness for several days. Guidance changes can be made within a matter of minutes." Reason for the long countdowns and lengthy preparations at Canaveral today, the general points out, is largely because this is a test center, where all kinds of electronic gadgetry and telemetering instruments must be hooked up to provide information about a flight. Today Thor and Atlas arrive in Canaveral on trailers similar to the rigs that will one day carry them to any location. For tactical launchings, electronic mechanisms will be housed in mobile trailers.

Atlas Stands 80 Feet High

Even more awe-inspiring than Thor is the mighty Atlas. Towering 80 feet in its 12-story gantry, this colossus measures more than 36 feet in circumference. It will carry its nuclear warhead some 6000 miles in 30 minutes. The base of the Atlas flares out to house twin booster engines rated at 150,000 pounds thrust each. Between the boosters is the "sustainer rocket"—a 1½-stage affair developing 60,000 pounds thrust. On a full-range launching, all three will ram the missile to an altitude of 600 miles and at a speed of 12,000 to 14,000 miles per hour. On the way, the booster engines drop off to reduce weight. At the peak of its trajectory, the Atlas' nose cone separates from the missile. Special ceramic construction, heavily insulated, prevents the destructive cargo and delicate instrumentation from melting.

Engines Correct Erring Course

Unlike earlier missiles in which cumbersome carbon vanes were suspended in the flaming exhaust to steer the rocket, Atlas has engines hung on gimbals that automatically change the direction of thrust to steer the rocket. On one recent flight an Atlas, due to some failure, flipped in the air and would have tumbled to explosive oblivion. Its swiveling motors, however, instantly swung to extreme positions back and forth, righting the rocket and pointing it back on course.

"We can get valuable information even from a 'failing' rocket," says General Yates. According to the General, Canaveral has had only three missile failures in which the desired missions were not accomplished.

Another little-known innovation on the Atlas is the use of small rockets to guide the missile after its big engines have spent

their fuel. And they spend it fast! The only external "plumbing" on the sleek rocket consists of two fuel lines; one, about the diameter of a telephone pole, feeds a torrent of propellant to the motors, the other, on the opposite side, is a line for helium.

Several of the big missiles use supplementary rocket motors you don't often hear about. Out on the Jupiter Complex, where Explorers I and III were fired into orbit, small rockets spin the solid-fuel motors prior to take-off. Vanguard's third stage is spun by similar rockets in flight — just before firing. This is done to offset any uneven burning of fuel.

Countdown a Busy Time

During countdown (which may start days before a test flight), one of the busiest places on a complex is the blockhouse. These buildings, some 200 feet in diameter, are 12-sided caves completely sealed during the final stages before take-off. The walls, 9 feet of concrete covered with 10 feet of sand and capped by a layer of grout, are designed to withstand direct impact of any missile that might go haywire and spin down against the structure under full thrust. One Bomarc at Canaveral did flip over on its back and plunge squarely into a blockhouse at supersonic speed. Glass shattered and instruments were jolted awry, but no one was hurt.

During launch preparation, crews in the blockhouse watch the progress on four TV monitors, and through four periscopes that are shielded from blast effect. Missile crews in protective suits crawl over the bird from "clamshell" platforms on the huge gantries. Atlas' gantry is so massive that elevators are used to carry workers up and down inside the framework.

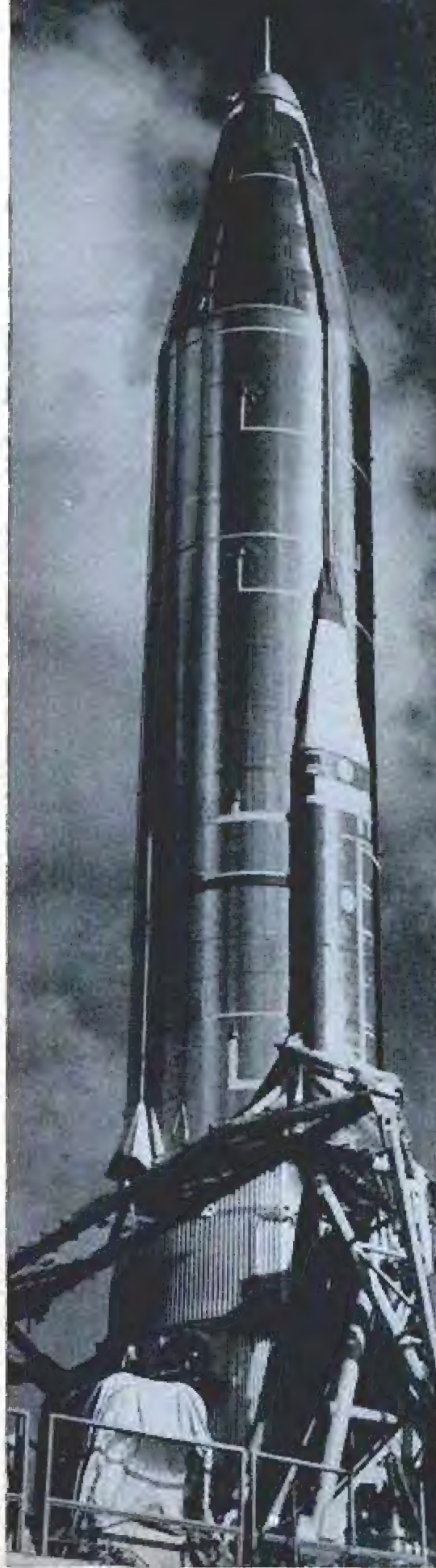
Most of these gantries straddle the launching stands and are backed away before the firing. Atlas' stand, however, is so big that its gantry sits on rails right on top of the launching platform. When the missile is ready, a huge "flatcar," just the height of the stand, moves in on tracks. Steel rails on the car are matched up with rails on the stand, and the gantry is backed onto the car at a rate of about six inches per minute. Flatcar and gantry then take a ride of 500 feet to one side of the pad.

Fueling Is a Touchy Job

Loading touchy fuels and liquid oxygen is one of the last chores performed, and there's good reason why the crews wear protective garments. Not long ago, a crewman carrying an insulated container of LOX (liquid oxygen) saw a snake at the edge of the pad. He spilled some of the minus-400-degree liquid on the reptile,

(Continued to page 230)

COUNTDOWN!



Anxiety shows on faces of personnel in missile blockhouse as Atlas engines start at the end of the long countdown

WHEN A MIGHTY ATLAS missile rises slowly from its launching pad at the Air Force Missile Test Center at Cape Canaveral and begins its flight over the Atlantic missile range, the nervous tension that has been building in the blockhouse reaches its climax.

For the Convair-Astronautics engineers and technicians in the blockhouse, this is the culmination of long hours of work under mounting pressure.

In a few seconds they will know whether their weeks of preparation, ending in a dramatic countdown, have led to a flight that will prove valuable to the Air Force's intercontinental ballistic missile research and development program.

On some flights the countdown has extended for more than 12 hours. On other occasions when

Two minutes after liftoff, crew receives word that the Atlas flight was successful and smiles replace anxiety





Sequence photos recorded by high-speed camera show take-off of Atlas intercontinental ballistic missile

all the vast array of equipment needed for a test flight has worked perfectly, the countdown has been as short as seven hours. The long countdown periods are necessary only while the missile is in the research and development phase; when a weapon system becomes operational the

countdown can be measured in minutes rather than hours.

But while the complex missile is being tested, Convair and the Air Force obtain exhaustive minute-by-minute data on each firing. Scores of valves and electrical connections and instruments and circuits and

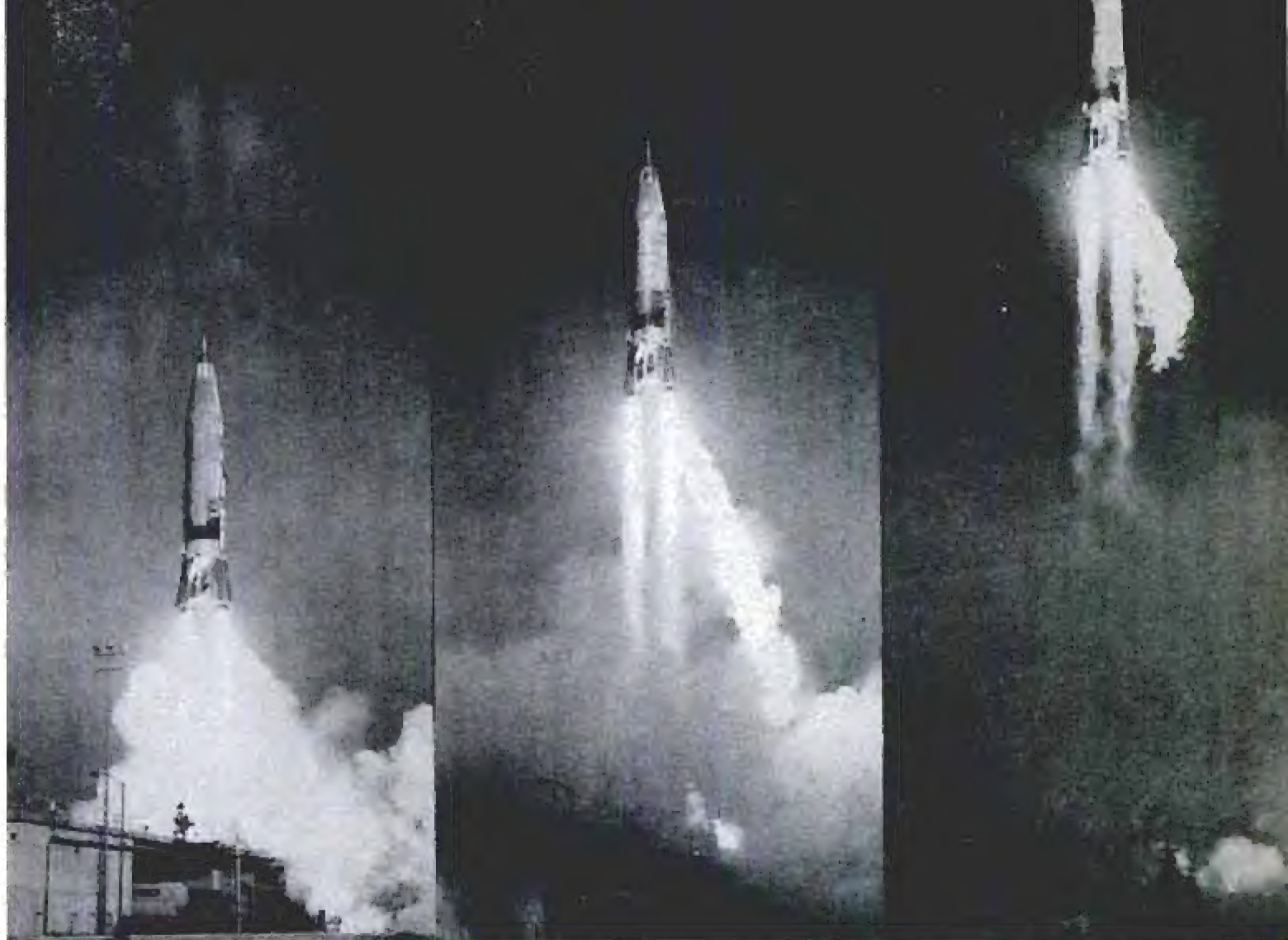
Crew in blockhouse can watch missile on television screens above console



tanks and lines and hoses are checked one by one. Then, when the critical individual parts have been okayed, the testing turns to sub-systems and, finally, to entire systems.

Activity in the blockhouse begins shortly after midnight as the test conductor and key people arrive at the blockhouse, carrying their lunches.

By 1 a. m. the crew has gathered and is busy with such tasks as turning on the blockhouse air system, checking the closed-



As Atlas climbs from launching pad, twin jets appear below rockets; plume of flame is turbopump exhaust

circuit television units with which they watch the missile, and testing the communications system.

At 1:20 a. m. everyone is at his station, the test conductor at his console in the center of the room with others at panels and consoles arranged in a U around the conductor. Behind the test conductor are chairs for observers, each with a headset that can be switched to any of the six telephone circuits used during the test.

At 1:30 a. m. the countdown starts. Carefully following his list—more than 80 typewritten pages long—the test conductor begins checking the missile, its ground equipment and the test and control equipment in the blockhouse.

The test conductor starts down his list, perhaps instructing the crew to check a valve. He waits until he obtains reports that it can be actuated remotely from within the blockhouse, and that the control panel shows whether it is open or closed. Then he checks the next item on the list, and then the next, breaking in periodically to announce:

"T minus 380 minutes and counting." "T minus 340 minutes and counting."

As the minutes tick by, the only sound

in the blockhouse is the voice of the test conductor as he continues his checklist and responses from one of the panel operators.

With a little more than an hour to go, the huge service tower that has surrounded the missile is rolled on railroad tracks to a spot about 800 feet from the missile. The area around the launching pad is cleared of personnel, and roadblocks are set up to keep vehicles off roads too close for safety.

After determining that the area is secured, the test conductor orders the missile fueled.

"T minus 40 minutes and counting," he announces.

A white plume rises from high on the missile, indicating that the vent valve is open.

"T minus 15 minutes and counting."

The blockhouse doors are closed and fastened. No smoking is permitted. The tension that has been building all night now is felt by everyone present.

"T minus 10 minutes and counting."

The test conductor receives a favorable report on the weather and a report from the range safety officer: There are neither ships nor planes in the flight path.

"T minus seven minutes and counting."

The test conductor receives a report that stray radio signals from an undetermined source are interfering with the test-range instrumentation. He is ordered not to fire until the interference can be traced and stopped.

"T minus six minutes and holding."

The minutes pass slowly in the blockhouse as range personnel trace the signals.

Finally the test conductor is forced to give the order he had hoped would not be necessary:

"Dump the liquid oxygen. Recycle the count to T minus 36 minutes and holding."

Although he knows it means a long delay and the range might be ready at any second, the test conductor is afraid to hold the liquid oxygen any longer. Its temperature is 297 degrees below zero Fahrenheit; if it were held too long in the tank some of the missile parts might freeze.

Thousands of gallons of liquid oxygen pour from the tank and run down a drainage channel toward the ocean. Within minutes it has "boiled off" into clouds of white vapor.

The test conductor orders more liquid oxygen sent to the site, and arranges for the trucks to pass through the road blockade.

Meanwhile, the report comes that the range is ready. The offending signals came from a military post more than a thousand miles away and the post has shut down its

radio operation for the duration of the test.

With the new supply of oxygen delivered and the trucks safely out of the area the count resumes: "T minus 36 minutes and



Work platforms in center of gantry tower are folded upwards when gantry is rolled away from launching pad of the Atlas

Firing missile also can be tedious. After 10 hours of continuous duty, countdown crew is delayed by "hold"





Members of Convair-Astronautics blockhouse team make remote check on missile through their console

counting." Nearly two hours have been lost. Again liquid oxygen is pumped into the missile.

"T minus 10 minutes and counting."

The test conductor receives new reports on the weather, range instrumentation and range safety.

"T minus four minutes and counting."

A flow of water is started over the flame deflector to preserve it from the blast of the rocket engines.

"T minus three minutes and counting."

The fuel level is checked. A safety device on the destruct package is removed.

"T minus two minutes and counting."

Missile electric circuits are switched to internal power sources.

"T minus 90 seconds and counting."

A light indicates that the telemetering is ready to go.

The test conductor checks with several panel operators:

"Command on internal," he says.

"Roger," responds the panel operator.

"Telemetry in launch condition."

"Roger."

"Missile on internal d.c."

"Roger."

"T minus 60 seconds and counting."

The test conductor asks for reports on the water flow over the flame deflector. The flow is checked on a meter on a panel, by an observer at a periscope and another observer who sees it on a television screen. The test conductor resumes checking.

"Range safety light on."

"Roger."

"Range ready."

"Roger."

"Water system ready."

"Roger."

"T minus 40 seconds and counting."

The level of liquid oxygen is checked and adjusted if necessary.

"T minus 35 seconds and counting."

Telemetering recorders are turned on.

"T minus 27 seconds and counting."

Automatic Controls Take Over

The test conductor checks his console. Every light is on, indicating every major system ready. He pushes a button on his console. This is the last human act necessary for launching the missile. For the next 37 seconds an automatic sequencer will do all the work. Only if something goes wrong will there be human action now to stop the test.

"T minus 20 seconds and counting."

Panel operators keep their eyes glued to their dials and charts, monitoring information being relayed to them electronically. If anything fails to function perfectly the test still can be halted.

"T minus 15 seconds and counting."

The water flow over the flame bucket increases to its full force of 35,000 gallons per minute.

Automatic cameras around the stand begin operating.

"T minus 10 seconds and counting."

"Nine, eight, seven . . ."

Another set of cameras starts.

"Six, five, four . . ."

The vernier engines start.

"Three, two, one."

The last set of cameras starts.

"Zero."

Silence in the blockhouse is broken by the simultaneous cry of "mainstage" from the two periscope observers.

(Continued to page 234)

Some panels control equipment on the Atlas ICBM, others record what's happening to missile systems





They Learn To Dive

By Henry F. Unger

IF JERRY DOYLE, owner of an acrobatic ranch in Phoenix, Ariz., isn't careful he may come up with a diving champion who can't swim.

One or two of Doyle's students actually learned the techniques of diving at his ranch before he discovered they didn't know the rudiments of swimming.

At the Doyle Acrobatic Ranch, youngsters from 3 to 18 years old learn to dive by using gymnastic equipment. How good is this method? The ranch has turned out a number of Arizona state champions. Doyle's No. 1 prospect at present is Susie Peterson, current junior state high and low champion, best in the 13-and-under class and Phoenix city titlist.

Open throughout the year, Doyle's ranch includes spidery steel handstand bars spaced among



Top photo, coach Jerry Doyle operates controls of practice apparatus while one of his students gets set to spring. Left, Doyle helps boy attain proper form in exercise that builds shoulder muscles and develops balance and self-confidence



Before They Swim

at this unique ranch in Phoenix where young champions begin on trampoline and sawdust pit instead of swimming pool

trampolines and sawdust pits. It is a maze of acrobatic gear and weights and exercise bars. Go to the ranch any day and you will find about 40 youngsters working out.

Doyle says his gymnastic method of teaching diving is a successful short cut to the city's springboards because the important assets in diving are strength and coordination. These are the assets he develops on his ranch.

Winner of more than 25 state and Pacific coast diving championships in his competitive days, Doyle gives his students at least six months of gymnastic diving before taking them to a pool.

During that period the students lift weights,

Top photo, a student does perfect dive into trampoline. Doyle trains youngsters at least six months in gymnastics. Right, older visitors are allowed to whirl on this revolving machine. Acrobats often work out on Doyle's equipment





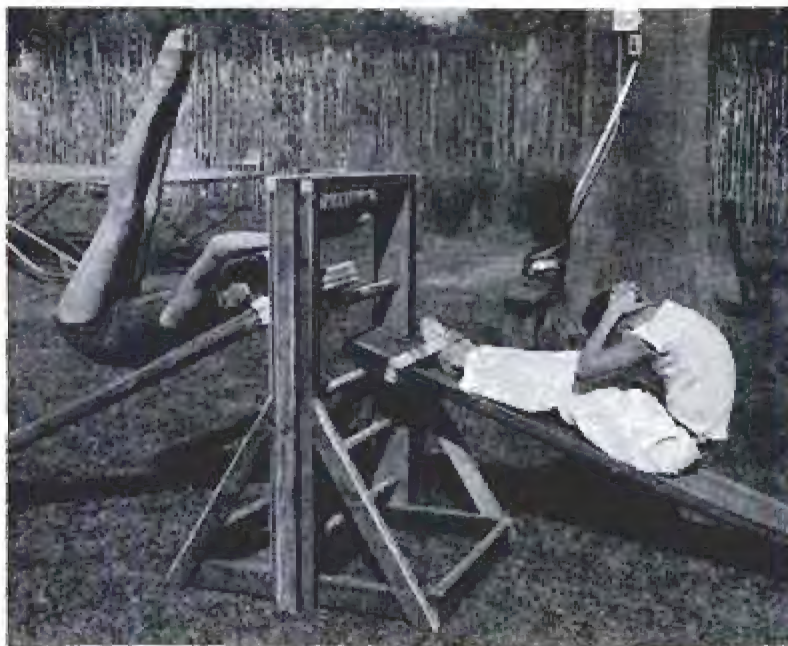
Student lifts 38-pound bar for strengthening of pectoral muscle. After lifts, bar goes into grooves



Thirteen-year-old Susie Peterson, a state champion, looks like circus aerialist while limbering muscles

Atop one of three trampolines found on Doyle Acrobatic Ranch, Jerry Doyle, himself a former diving champion, instructs student in position she will use later on springboard at one of Phoenix' pools





Abdominal boards prepare neck muscles for championship competition and build up stomach muscles used in diving



Cutaway dive on trampoline. Doyle concentrates on developing form, strength and coordination

flip-flop on three trampolines, perform on the sway bars and build muscles and sharpen timing in many other ways. In his office, Doyle maintains an up-to-date chart of each student's progress. Though his final goal for each of the students is championship diving, he never allows any boy or girl to move along too quickly.

Some of Doyle's weights are handmade. They range from 6 to 300 pounds, some of them concrete-filled cans.

At one end of his acrobatic ranch, Doyle has rigged a high piece of equipment that enables the student to simulate five basic dives without harming himself. A belt is applied to the student and attached to a line controlled by Doyle. This gives the novice confidence. On this apparatus the student can practice the front, back, gainer, cutaway and twist dives from a near-the-ground, adjustable diving board that Doyle made. Students practicing on this board learn to give their body lift

One of Doyle's three-year-old tots begins training by hoisting six-pound weight. Shoulder muscles and balance are improved by using handstand





Trampoline built into ground is used by beginner. Cord instills confidence and prevents bad flaps

and power while springing from the board. This is where their fear is overcome.

At other pieces of equipment, students develop shoulder and back muscles and make their muscles supple. They also develop correct breathing methods. In two-hour periods twice a week, students devote a half hour to ground tumbling, one hour to 40 trampoline exercises and another half hour to bodybuilding with dumbbells and barbells. Doyle finds that his students enjoy these fundamental routines.

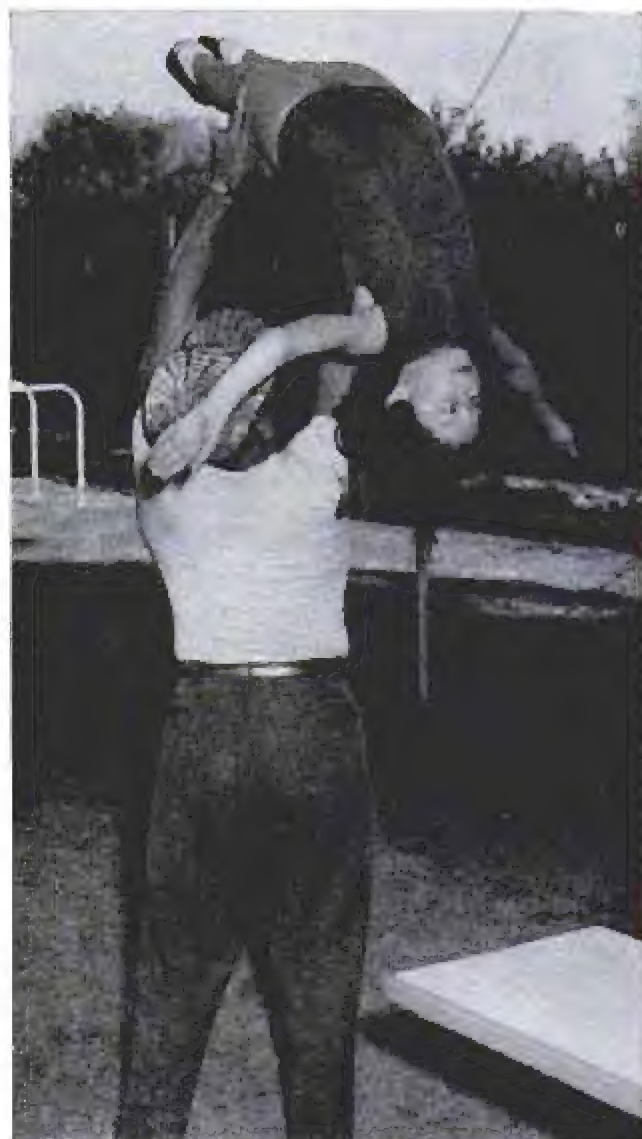
"Students can learn to dive well without my method," he says, "but I feel that it takes much longer, and many of them who want to become champions must unlearn many bad habits." ★ ★ ★

Landing Mats for Jet Planes Built Like Plastic Sandwich

Army engineers have developed a landing mat from plastics that may eventually be used for jet-bomber landing strips. One of the mats, to be subjected to actual airplane traffic, looks like a giant sandwich. The "bread" is a solid sheet of plastic reinforced with glass fibers. The "filling" is a plastic honeycomb-core material and the "dressing" is phenolic resin.

Engineers predict that use of boron compounds as high-energy fuels will extend the range of aircraft by 25 to 50 percent, revolutionizing the design of jets and rockets.

While Doyle stands in front of low diving board, students practice diving into his outstretched arms



CCHEVROLET FOR 1959 will be as spectacular as the Brussels Fair. Spies say it is four inches wider, four inches longer, with a dream-car front end. One report puts its two upper-beam headlamps vertically in the center of the grille, its two low-beam lamps in the fenders. The grille is said to be sort of "sports-carish." These are rumors, of course.

But no rumor is the fact that the 1959 Chevy is fresh and new. Not one square inch of sheet metal has been inherited from 1958. Two completely new cars in two consecutive years must set some sort of a record in the industry.

Ford, too, is all new, but still recognizable. Its front end has a split front bumper like Mercury and Edsel. Taillights are round wagon wheels again.

Plymouth gets the biggest change at Chrysler. All-new front end restyled tailfins and a flashy interior give it a new personality despite the fact that it retains the 1958 basic body shell and outline.

Cadillac's tailfins will be more emphatic than ever. Its new car (on an all-new shell) will be longer by about an inch. The shorter models of the Cadillac may be dropped. Why? The public doesn't buy short Cadillacs. No wonder the industry keeps making cars longer!

Air suspension which has virtually disappeared from showrooms may be standard on top Cadillac lines in 1959. It's difficult to sell air suspension as an option because the salesman must deprecate the ride of steel-sprung models. You can't get a Cadillac salesman to do that (for one reason, it isn't true, but he wouldn't say it even if it were true).

Buick will be flashier, longer and lower. GM is going all out to breathe life back into Buick's veins. Once a star on the team, it has sagged badly. Oldsmobile needs no special attention as it continues to prove that "chrome" sells cars (it's really stainless steel, not chrome).

Stylists vs. Gingerbread

Stylists don't like gingerbread, but what can they do? People (not you, of course, but people) go out and buy jazzed-up cars. For proof compare the success of the 1957 Olds with its 1958 bejeweled counterpart.

All 1959 GM cars will be out before the end of October. Plans are, at the moment, to hold a Motorama at that time in New York City.

General Motors worries about the effect of a small car on Chevrolet sales. Pontiac and Buick are the two GM divisions that are in sales trouble and they are the two with small cars (Vauxhall and Opel). Is it just coincidence or have the small cars hurt sales?



DETROIT LISTENING POST

By Art Railton

When Chevy sells GM's upcoming small car, what happens to its big-car sales?

Rarely has Detroit been so criss-crossed with rumors as today. Everybody's got the latest and most involve the small car.

No subject in recent years has been so researched, surveyed and investigated. Detroit feels (with some justification) that it is being unfairly condemned. After all, Detroit is only trying to build the cars the public by its buying habits has shown it wants.

If Detroit's critics (and they are everywhere) really believe there is an overwhelming demand for a small car why don't they put their money where their speeches are? How about it? Would you risk millions of your dollars on a small car?

Not Enthusiastic Yet

This is what the industry is saying to itself. It is still not wholly convinced that you, the car buyer, really want smaller cars. Ford and General Motors are going ahead with their small-car programs, but their hearts are not in it yet. They are just covering the long shot with a minimum bet. Their big money is still on the favorite—America's favorite, the big car.

There may be a break in the clouds. For the first time since the war, the public's historic buying pattern shows signs of changing. Whether it's the recession or a change in the public's taste nobody knows, but sales of the cheapest models (Chevy's Del Ray, Plymouth's Plaza) show an unusual increase while sales of the top lines slide. This may be the evidence the industry needs to get enthusiastic about the small car.

It doesn't ask for a money-back guarantee. It simply asks you, the public, to demonstrate that you'll buy small cars. The industry, big, unwieldy and sometimes wrong as it is, is a willing giant—willing to do whatever will sell cars at a profit.

It will build covered wagons drawn by mechanical horses if you can demonstrate they will sell enough to make a profit.



F. A. S. T. men examine 6-foot wing of model that set new world endurance record of 5 hours, 29 minutes

THEY'RE OFF

Getting set for a prerace trial, a "pilot" fuels his model of a P-51, famed U. S. fighter of World War II



This model of the XF-92A uses a pulse-jet engine that can be heard a mile while in flight





Members of the First All Speed Team of Los Angeles and some of the models they built and are flying

TO THE

RACES

GLENVIEW NAVAL AIR station in Illinois will be the cynosure of model-plane builders July 21-27 when 2000 hobbyists gather there for the 27th National Model Airplane Championship. Everything from World War I fighters to the latest jets will compete for more than 400 prizes to be awarded by the Academy of Model Aeronautics for proficiency in such things as acrobatic flying, combat and pylon racing.

The academy numbers about 19,000 members in 400 local clubs throughout the United States. One group is the F. A. S. T. Club (First All Speed Team) of Los Angeles. Organized in 1946 by 10 men who had a common interest in speed model flying, F. A. S. T. members hold 10 national speed records and have won more than 200 awards in regional and national meets. Model-building and racing are truly a major avocation for F. A. S. T. men. They have held about 100 contests locally in the past 10 years and frequently give demonstrations at veterans' hospitals and before youth groups and civic organizations. Right now they're working on a series of detailed scale flying models depicting each of the important eras in the history of aviation. When they

finish this task—after another year or two of building — they'll have a Wright Brothers "Flyer" in the air along with a modern jet-powered plane.

Lots of Experience

The average member of F. A. S. T. has been building and flying models for more than 24 years. At the meet in Glenview, of course, there will be extremes in age and experience. Expected to fly planes in the events are a 9-year-old boy from Illinois, a runner-up last year for the junior title, and a 62-year-old man from Kansas. ★ ★ ★

Models of World War I planes make extremely good acrobatic aircraft in control-line flying, F. A. S. T. members discovered





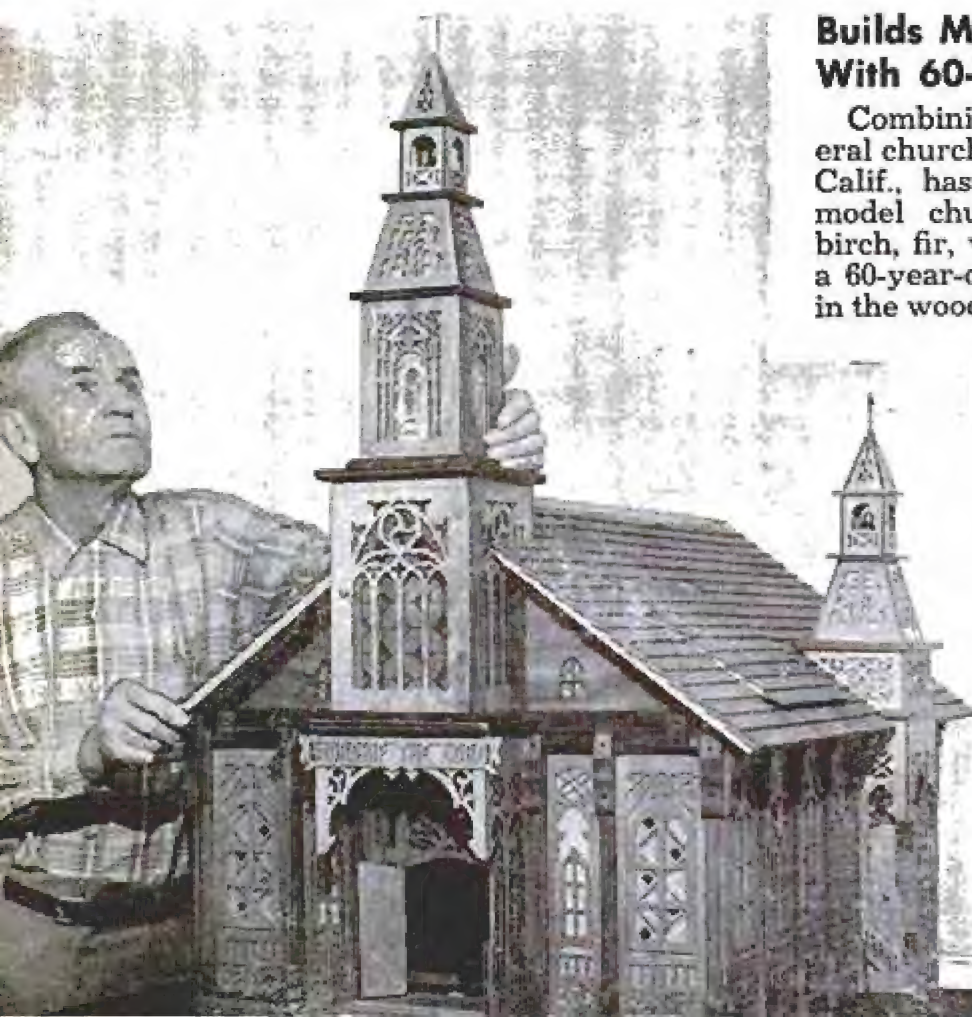
Tilting Photo Reflector Folds Like a Fan

Photographers who like the even illumination of bounce, or indirect, flash can now get a reflector attachment that tilts to three bounce positions. The attachment can be synchronized with the camera or it can be operated manually. The reflector folds like a fan if a photographer wants to carry it in his pocket. The unit will take either subminiature or standard flash bulbs.



Recorder "Files" Photos On Magnetic Tape

Still photographs can be stored on a magnetic tape recorder and played back later with all their original clarity and detail intact. The machine records the picture in the form of an output signal from a facsimile transmitter. Promising to speed radio transmission of photos, the machine sends a picture several times faster than ordinary facsimile transmission.

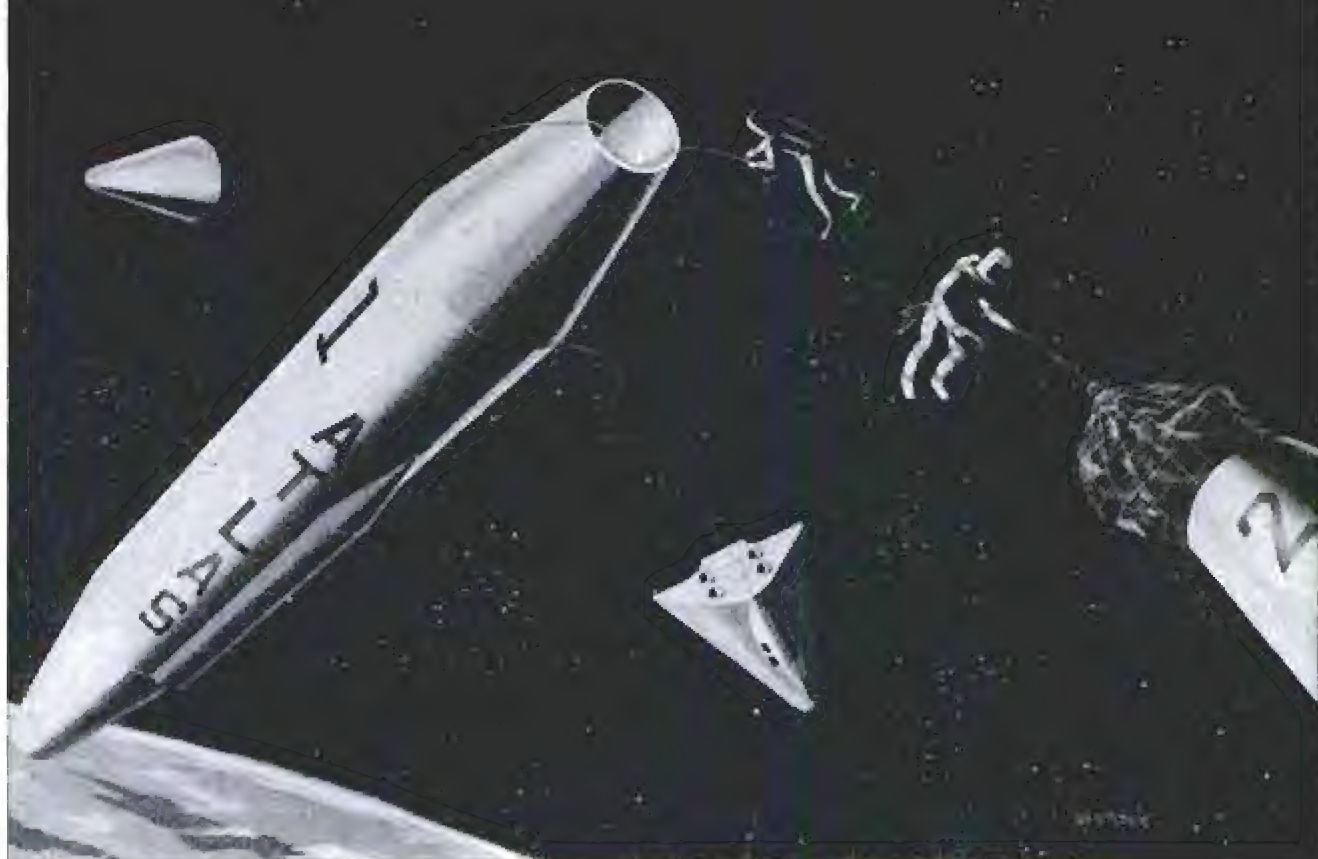


Builds Model Church With 60-Year-Old Saw

Combining architectural features of several churches, Morris Nelson of San Diego, Calif., has constructed a three-foot high model church from pieces of plywood, birch, fir, walnut and mahogany. He used a 60-year-old scroll saw to cut the details in the wood. The interior has electric lights.

Why Banana Stalks Are "Fireproof"

Scientists at the Forest Products Laboratory in Madison, Wis., are testing a chemical found in banana stalks which may become a commercial fireproofing material. At one time, it was believed that banana stalks were hard to burn because they contained a lot of water. Subsequent experiments have shown that the stalks contain a chemical which slows down the spreading of flames.

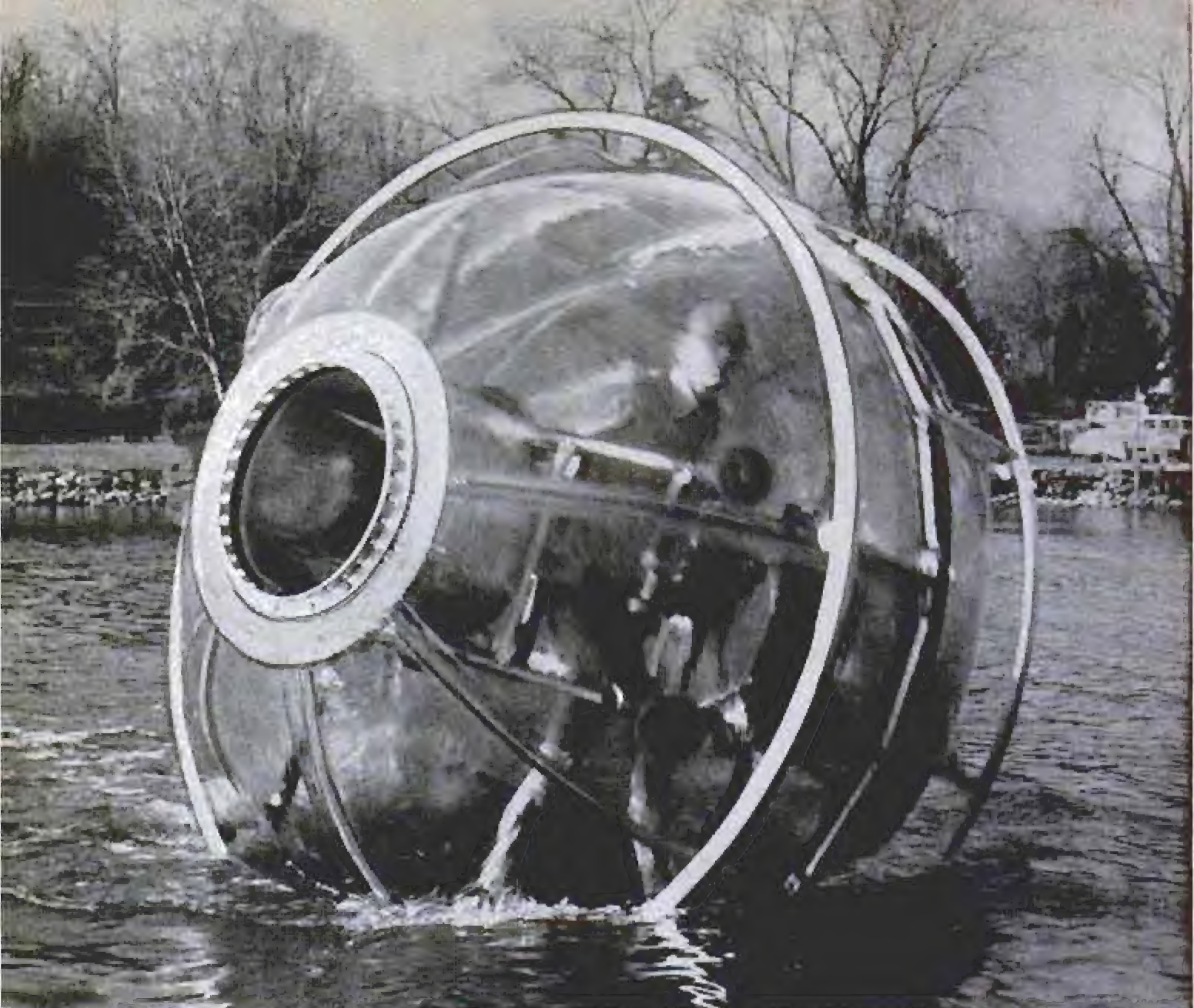


Manned Space Station in Five Years?

WITH THE ATLAS missile as a base, a four-man space station could be put into permanent orbit 400 miles above the earth within five years. That is the opinion of Krafft Ehricke of Convair-Astronautics, who includes in his conception a cargo ship

and a ferry vehicle. The crew of four would be housed in the propellant chamber which would create artificial gravity. When in orbit, the passenger and cargo ships would arrive, and the crew would build the four-story station inside the chamber.





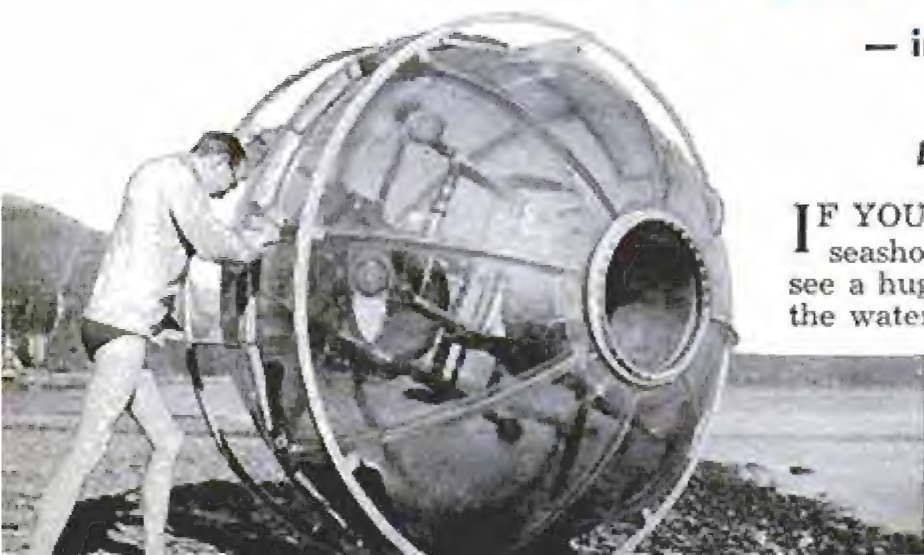
Inventor Wayne Wilson "treads" water without getting wet while inside the huge plastic bubble he constructed

You Can Walk ***ON WATER***

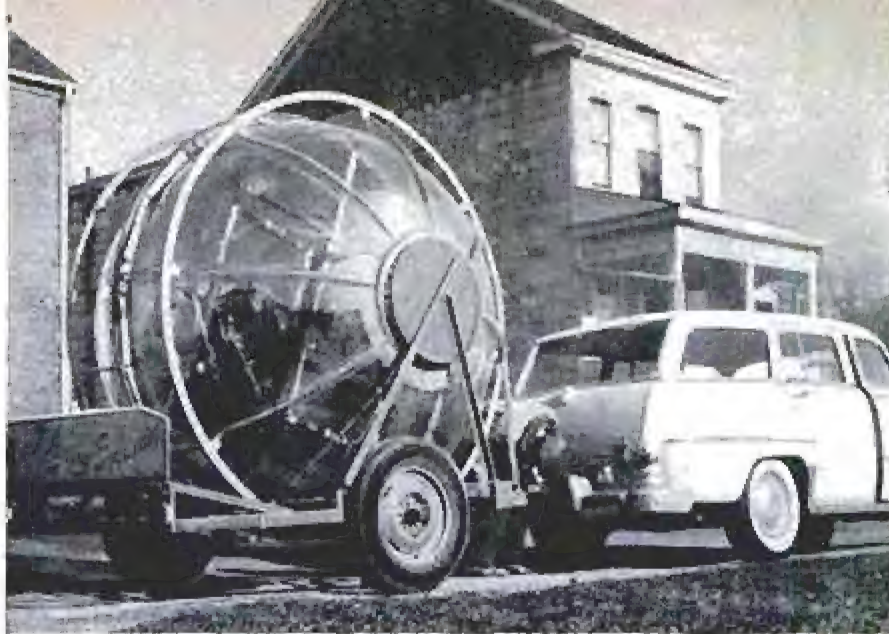
— in a General Electric
Engineer's Plastic Bubble

By Richard F. Dempewolff

IF YOU VACATION at an Eastern lake or seashore resort this summer and suddenly see a huge transparent bubble rolling across the water toward you, don't be startled. It's



Although ball weighs about 300 pounds, pair of steel runners around its equator makes it simple for one man to handle



Sphere can be rolled onto its special trailer which has ramplike track

only Wayne Wilson out for a walk in his "Water Trotter."

Spinning over the waves, the king-size plastic ball looks like a cross between a superbomber's gun turret and a vehicle from outer space. The belt of paddles straddling its "equator" kicks the water to a boil as Wilson walks inside, twirling the globe around him like a squirrel cage. When he steps toward one side or the other, the strange craft heels into gentle turns.

Wilson, a General Electric engineer in York, Pa., built the revolutionary craft in his spare time. The ball, tediously heat-formed under handbuilt electric ovens, on a die of his own design, consists of curved triangular sections—eight per hemisphere—all chemically fused into a solid, nearly indestructible globe eight feet in diameter. Upright edges on each triangular section form the paddles that permit the pilot to walk the craft along the surface of the water. A pair of rugged steel rims, circling the 300-pound globe on each side of its equatorial seam, allows it to be rolled along the ground easily by one man, without marring the plastic surface. Inside the ball, a framework of aluminum tubing on each side provides rigid support for the two cylindrical entry tunnels, two food and clothing lockers, and rotating handholds that the pilot grasps as he strolls across the waves.

There are several ways of climbing into the Water Trotter—none of them graceful. On a smooth beach, or gently sloping lake shore, you can wiggle through one of the side ports while the craft is still aground, and "walk" it into the water. If there's a pier handy, you float it alongside and crawl through a port while somebody holds the skittish sphere to keep it from spinning around and dumping you in the water. Easiest method, however, is to float the craft in waist-deep water. Then, as you

pull your torso into a side port, the ball will tip over on its side and surround you from the waist up. All you need do is grab a piece of inside framework and haul your legs up through the tunnel.

Most people, Wilson says, can't understand why the sphere doesn't swamp instantly when the open port is facing straight down in water. Once inside this rig, you see why it doesn't. If the port were just a hole in the skin, the ball would sink. However, from each port's rim, a

tunnel-like sleeve projects inward about two feet toward the ball's center. Even with two heavy people aboard, the sphere is so buoyant that water never comes more than about a third of the way inside the tunnel when the craft is on its "beam" end. The globe is righted by the simple process of walking up the side of its interior until the part you want in the water is under your feet. As you do this, the water in the entry tunnel obligingly spills out.

Though he hasn't had an opportunity to test the craft under all conditions, Wilson believes his bubble is one of the world's safest water vehicles. "She's got more than 800 pounds excess buoyancy when positioned with an entrance port in the water," he explains. "In normal position, there's more than a ton of excess buoyancy. That means it would take that much weight to shove her down far enough for water to come into the ports. Even then, she couldn't sink because her domed upper half would automatically trap twice as much air as she needed to stay afloat." ★ ★ ★

To watch regatta or to fish, Wilson turns one side down and sticks his head and shoulders out the port





Black-and-White Film Makes Color Projections

By placing a special mask in front of film in an ordinary camera, color photographs can be taken on black-and-white film, according to Dr. W. E. Glenn of the General Electric Research Laboratory. The method, which involves a complicated optical system, is still in the experimental stage. "Information" recorded on the film produces a full-color image on the screen through a special projector.



German Motorcyclist Combines Fun and Work

If you would prefer to go motorcycling, but must mow the lawn, you can combine them by replacing the rear wheel with your lawn mower. This was proved by a press agent at Germany's NSU motorcycle company who, with an almost straight face, released the photograph. There's no clue as to whether it's a stunt or not, but in any case it's a challenge to the man who owns both motorcycle and mower.

Tail End of Plane Made Into Trailer

There's just one drawback in using an airplane's tail for a house trailer. An Englishman who spent three months converting one into a mobile home for his wedding trip says he and his young bride were bothered by so many curious people that they were forced to stop for the night only in secluded places. Towed by a 10-horsepower farm car, the odd-looking trailer is weatherproof and wired for lighting. It has a double bed, kitchen with sink, dining compartment and cupboards and lockers.



British Four-Seater Jeep Folds Into Box

Using lightweight metals and airplane-construction methods, an English manufacturer has produced a Jeep-type vehicle that literally carries its own garage. The car, which is powered by a 650-cubic-centimeter motorcycle-type engine, has four seats which are placed in hinged sheet-metal panniers, or baskets. The two panniers swing up and in to form a box nine feet long. The wheels retract inside the storage unit. As the vehicle is folded, the weight is borne by spring-loaded hinged supports which can themselves be folded away. Speed ranges from 4 to 60 miles per hour and the 700-pound car can carry a quarter-ton load.



Model of Future Aircraft Takes Its Test Flights Atop Real Plane

De Havilland Aircraft Corporation tries out models of its new planes on a flying test bed. Usually, models of new aircraft

are tested in wind tunnels. In De Havilland's system, the model rides piggyback high above a specially fitted airplane.





Delivering bulky material for a merchant all week, the Italian Fiat Multipla is the family car on Sunday

By Arthur R. Railton

IT'S A FACT. Smaller cars are coming. The next question is: What shape will they take?

Are they to be conventional, scaled-down big cars (similar to such American-

ized imports as the Vauxhall Victor)? Or will they be unconventional, off-beat designs like the Italian Fiat, the German Volkswagen or the French Citroen?

The betting around Detroit right now is

Americans are learning it is roomy enough to haul furniture, stylish enough to park outside a lovely home



that conventionality will win out. Yet Europe's designers after long experience believe that small cars cannot succeed simply as shrunk big cars. Perhaps American designers will prove them wrong, but in any case the European viewpoint is certainly worth study.

Let's look at some unconventional designs to see what makes them different, to see what gives them appeal to the European.

Maximum utility in a minimum space is provided by the Fiat Multipla. This design (basically a cube with four wheels) is, as its name suggests, truly multipurpose. One moment it is a small truck that carries bulky packages, including furniture. The next moment it becomes a roomy, comfortable, family car. Yet, it is less than 12 feet long.

Being rear-engined (the water-cooled four-cylinder engine takes up only a little more space than the gasoline tank), it has no door at the rear (like most station wagons). Instead there is an extra-wide door about amidships on each side. Two other doors far forward serve the front seat.

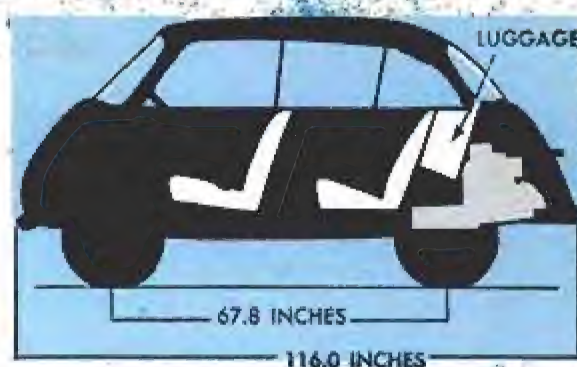
Its passenger compartment extends almost from bumper to bumper with virtually no overhang. All the space that is enclosed by sheet metal is accessible and usable. If you need room for several children, you can seat five or six of them in the back with reasonable comfort. The front seat accommodates two adults.

Certainly, the Multipla is not everything you might want in a deluxe family sedan, but it offers an exciting design idea that the Detroit engineer could adapt to the needs of this country.

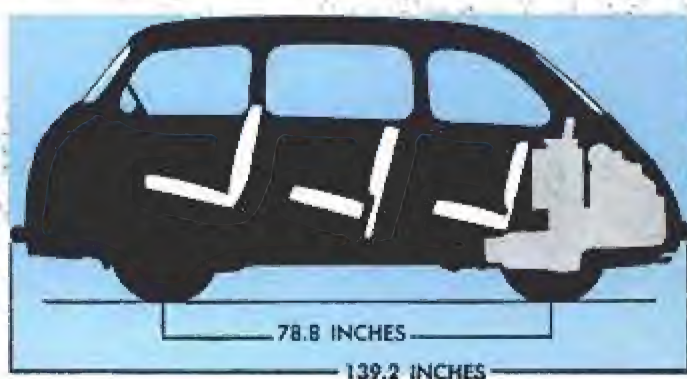
As an import, it has lots to recommend it. The price is only \$1600, its economy is excellent, getting over 30 miles to the gallon. And, of course, it is unbelievably roomy with more versatility than many body designs twice its size.

Another example of maximum interior room with minimum exterior dimensions is the new Isetta 600. This enlargement of the very small (obviously too small) two-seater Isetta has a rear seat and a second door on the side. It is now large enough to accommodate two adults and three children or four adults in an over-all length of

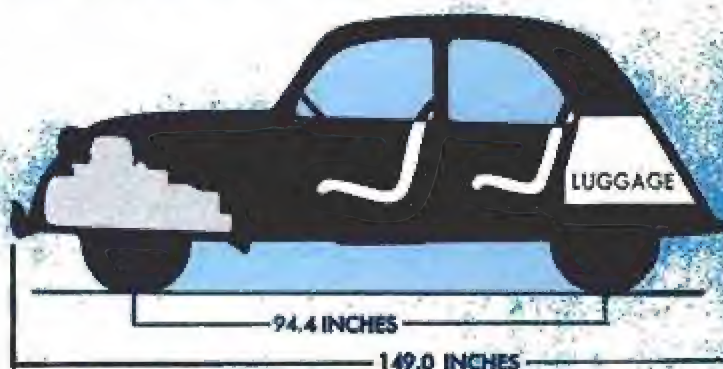
HOW ROOMY CAN A SMALL CAR BE?



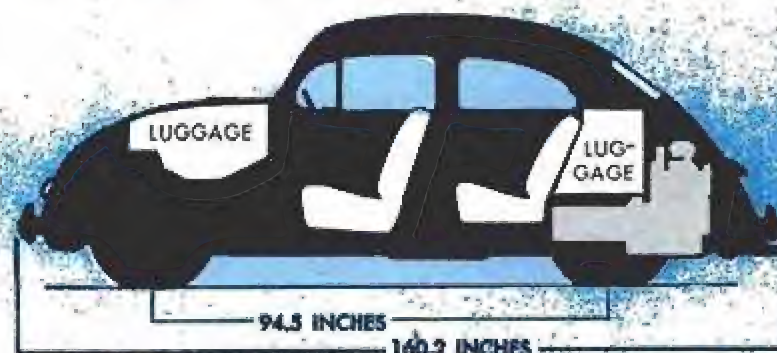
Four adults plus a small amount of luggage fit inside the tiny 10-foot-long Isetta 600. Its air-cooled rear engine is small, leaving virtually all interior space for people.

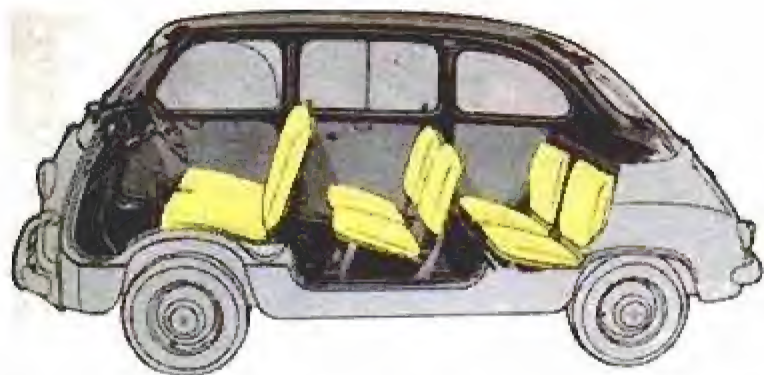


Two feet longer than the Isetta, the Fiat Multipla seats six—two, two and two. With six persons aboard, though, it provides no luggage space. The rear engine is water cooled.

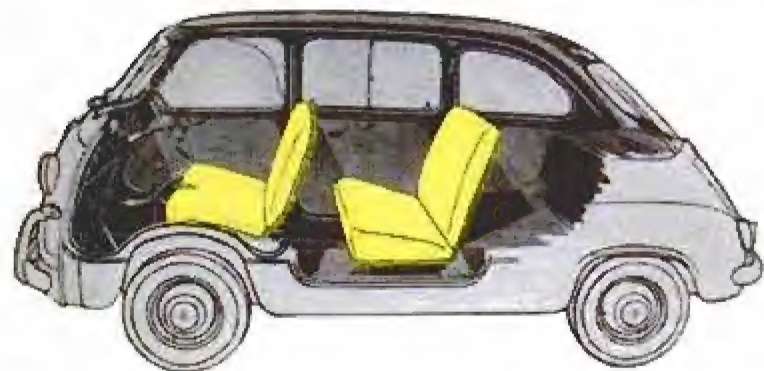


Citroen 2CV uses a front engine, front drive, to make room for four doors, four adults, plus luggage. Volkswagen, below, is a bit larger, has rear engine and two luggage spaces.

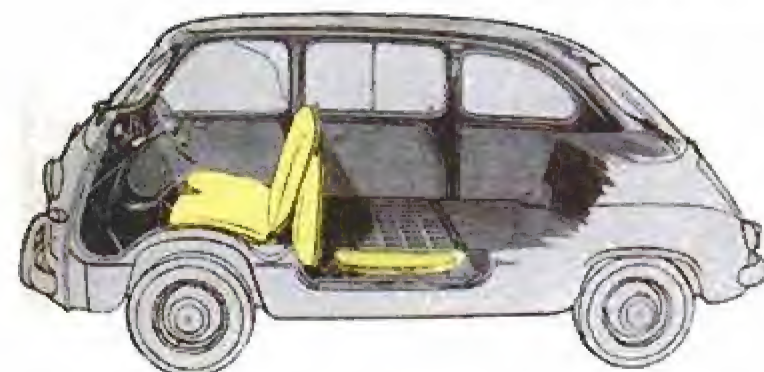




Proving its versatility, the Fiat offers a choice of seats. One choice has four separate seats in the rear



Another seating choice in the Fiat has the conventional bench seats plus a large rear luggage space



In both choices, rear seats fold into the floor to take bulky items or to make a children's play area

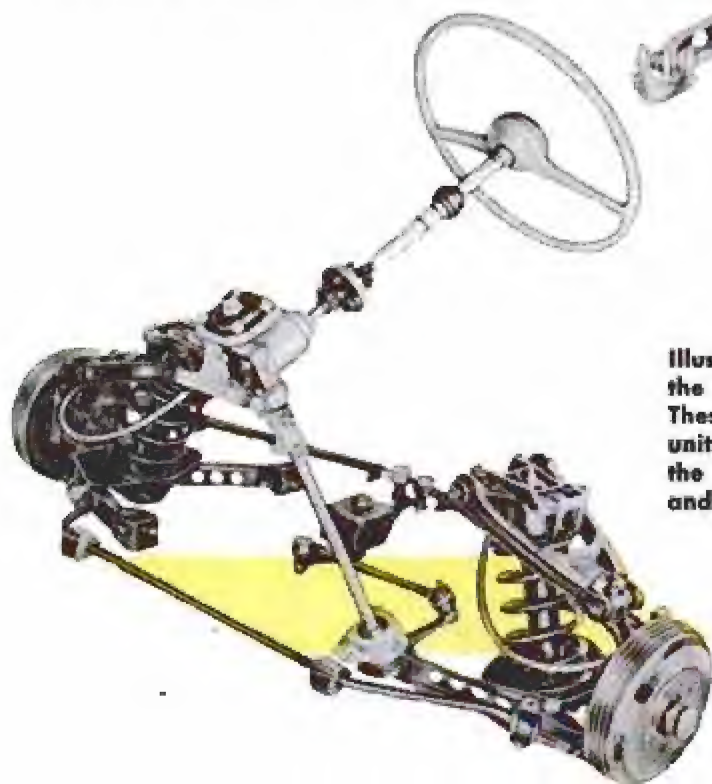
under 10 feet. This, too, is a rear-engine design and while considerably more primitive and rudimentary than Americans would buy in volume, it is an exciting challenge to designers trying to get economy of space.

The French Citroen 2CV, as ugly and as lovable a vehicle as ever drove through the Arc de Triomphe, combines an air-cooled front engine with front-wheel drive to eliminate the space-wasting driveshaft and rear-axle differential. Incidentally, ugliness is not essential to small cars, although Citroen tries to prove that it is. Renault, its competitor, is rumored to be preparing a stylish version of the Citroen 2CV for production in the near future.

The Citroen has four doors and will seat four adults in comfort. The suspension is as soft as a featherbed and the seats are entirely rubber-sprung.

French farmers put the car to work as a truck, hauling animals in it on occasion. They simply lift out the rear seat (it comes out in seconds and can be used as lawn furniture) and push the animal inside. The roof rolls back to permit the animal's head to stick up and give it an unimpeded view down the road. Yet the car is only 12½ feet long.

Everybody is familiar with the German Volkswagen and with its rear engine and rear-wheel drive. Big enough to seat five



Illustrated here as an example of unconventional design, the Multipla has integral construction without a frame. These elements of the running gear attach directly to the unit body. All four wheels are independently sprung and the car, although very small, has excellent roadholding and a reasonable amount of comfort under most conditions

adults or two adults and three children, it also has luggage space behind the rear seat. Additional luggage space is provided under the hood (which space is shared with the spare tire and gasoline tank). Over all, the Volkswagen is 13½ feet long, making it the longest of the cars under study here.

What about the weight of these small cars and its relationship to load carried? After all, weight means money—money to pay for the added material and money to pay for operating costs. Theoretically, at least, the lighter the car, the cheaper it is to operate.

The Isetta, smallest of the four shown here, weighs 1130 pounds or roughly 280 pounds for each of the four persons it can carry.

The Fiat Multipla weighs 1610 pounds or roughly 270 pounds for each of the six persons it can carry.

The Citroen weighs 1125 pounds or 280 pounds for each of the four persons it carries.

The Volkswagen weighs 1609 pounds or about 320 pounds for each of five carried.

Compare this with the Vauxhall which weighs 2110 pounds, a per-occupant weight of 420 pounds for each of five persons. The American 1958 Ford Six weighs 3255 pounds or 543 pounds for each of six occupants. The 1958 Plymouth Six weighs 3255 pounds or 542 pounds per person. The 1958 Chevrolet Six weighs 3440 pounds or 573 pounds per person for six occupants.

Weight saving and maximum usable space for minimum exterior dimensions are two of the advantages of unconventional small-car designs. What are some of the disadvantages?

First, in the case of the Fiat and Isetta at least, there may be an initial feeling of insecurity. You sit right up front with nothing between you and the hazards of the road except a sheet of metal. This feeling quickly disappears, but it could be a psychological barrier to sales. The writer has never driven the new four-passenger

Isetta (he has had considerable experience with the smaller two-seater, however), but the Fiat Multipla has such excellent handling and roadholding characteristics that the driver soon forgets that he is sitting right out in front. Actually, there is no evidence to prove that a front engine protects you anyway.

Second, the driver and the front-seat passenger sit atop the wheels of the Fiat and the Isetta. This makes the ride slightly choppy than an American car buyer is accustomed to, but it is not uncomfortable. The Volkswagen and the Citroen do not have this disadvantage as you sit between the axles and the ride in both of these cars is entirely satisfactory.

Third, the blunt front end of the two smallest cars in the foursome offers more resistance and therefore reduces speed and asoline economy somewhat. The two larger designs, the Volkswagen and the Citroen, do not share this disadvantage, having a smaller frontal area.

Finally, there is the matter of styling. None of these four cars could be considered stylish by American standards. Whether the American car buyer will settle for anything as radically different as this type of body is a question at the moment. Increasing sales of such "different looking" imports as the Volkswagen and the Renault Dauphine offer some evidence that the public is not entirely opposed to nonairborne styling.

Around the world, the most successful small cars are unconventional by American standards. Whether the United States is to be an exception remains to be seen. There is no certainty that any one of these four designs or any combination of their features would be an ideal small car for America.

But the American public awaits the designs from Detroit and many are anxious to learn if Detroit, starting from scratch as it probably must, adopts any of the features of Europe's most successful designs. ★ ★ ★

Navy's Ice Lookout Protected From Cold

Mounted about 10 feet above the deck of the USS *Eldorado* is a glass-enclosed platform where Navy men stand "ice-lookout watch." The ice-lookout station is designed to protect the lookout from the cold weather of Arctic waters. *Eldorado* is the flagship of the task group transporting supplies to radar bases of the DEW line.

☐ The United States is contributing \$350,000 toward the cost of a nuclear research and materials-testing reactor for Sweden.





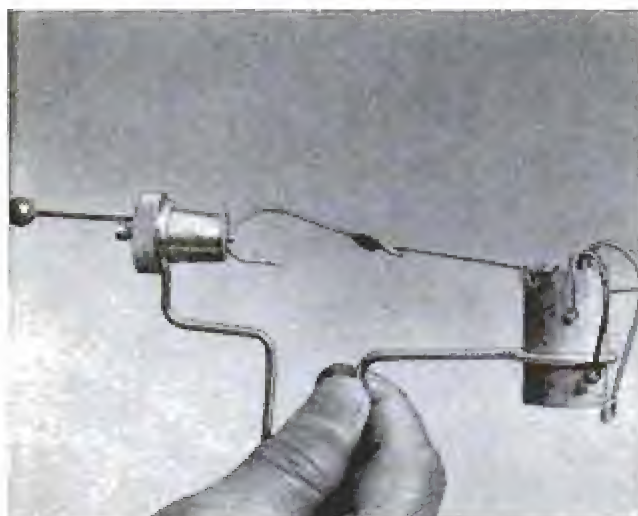
Is This the Plane That Fires Missiles Backward?

Release of the first drawings of the A3J, the Navy's new attack plane, has led to speculation that this may be the plane that "fires missiles backward." The A3J has a podlike configuration between the two jet engines, extending to the rear of the fuselage. Any missile fired to the rear would enable an attack plane to be a considerable

distance away at the moment of missile impact. Built by North American Aviation, the A3J is a two-place, carrier-based plane powered by twin General Electric engines, each of which develops 15,000 pounds of thrust. The A3J attains supersonic speeds. It is 70 feet long, has a wingspan of 50 feet, and the wings and tail fold for storage.

Holder Permits Angler To Snell Hooks Quickly

With the aid of a new hook holder, the angler can quickly snell and tie any size hook, using leader material from rolls. The hook is pinned firmly in the holder for the work, and the leader material is passed through a slotted cork to prevent tangling. The holder then is revolved, turning the leader material around the hook just below the eye. The holder can be used to snell or tie a new hook on a leader or line coming off a fishing pole.

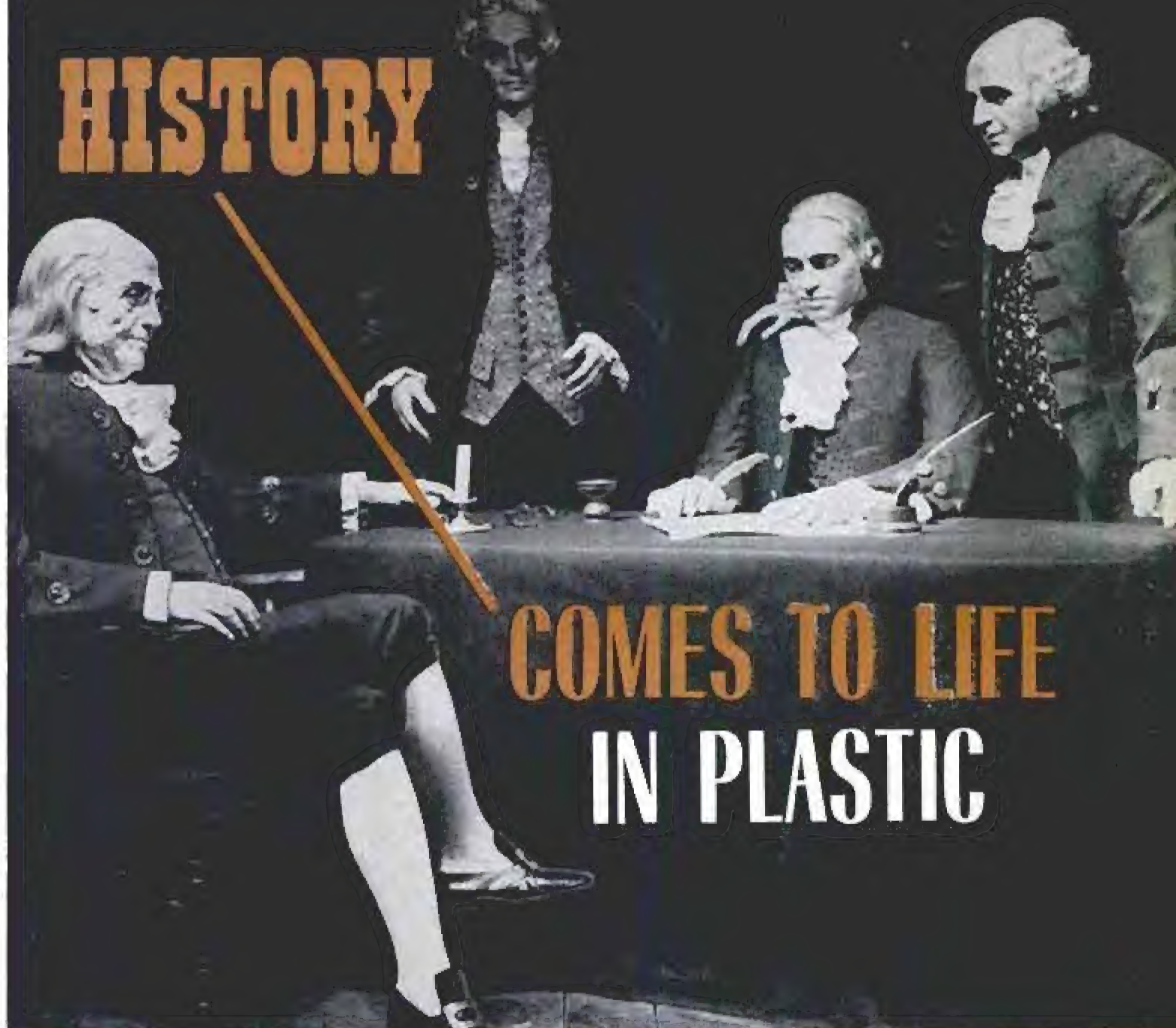


Spectacles With Pinholes Reduce Eyestrain

Eyestrain produced by strong sunlight and bright electric lights can be diminished by opaque lenses with pinholes. Called stenopeic spectacles, the glasses contain five rows of pinholes placed scientifically to give the highest degree of glare protection. In addition to their value in reducing eyestrain, the stenopeic spectacles have been found to be valuable in many cases of subnormal vision. The glasses are made of plastic.



HISTORY



COMES TO LIFE IN PLASTIC

Declaration of Independence is re-enacted by lifelike figures of Franklin, Jefferson, Hancock, John Adams

By Kenneth Anderson

Plastic hair strands inserted individually make eyebrows, mustache of Oliver Wendell Holmes



AT THE REAR of a theater box in Washington, D. C., stands a mustached man with a single-shot derringer in his hand. The pistol is aimed at the head of President Abraham Lincoln. The year is 1958, but a visitor to the National Historical Wax Museum is transported back to the night of April 14, 1865, when John Wilkes Booth assassinated Lincoln in Ford's Theater.

The figures are just mannequins, yet the realism is so keen that you would be startled only briefly if they moved or spoke. Their skin has most of the epidermal details of human skin—veins, pores and even the loops and whorls of finger ridges. The faces may have wrinkles, dimples or, in the case of Lincoln, a mole to the right of





Plaster molds, above, are made from heads sculptured in clay. Liquid vinyl sloshed inside molds forms faces and scalps of figures. Tableaux dramatize Lincoln's assassination and 1945 Yalta Conference



the upper lip. Some visitors have been observed "reading fortunes" from the "life lines" in the palms of the hands.

The secret of the realistic "flesh" that the visitor sees is in a special vinyl plastic material, similar to that used in the manufacture of artificial limbs. The plastic skin is only $\frac{1}{16}$ inch thick and is reinforced by a much thicker layer of a flesh-colored wax. The vinyl material has an ability to pick up minute details from a mold, which makes it especially valuable for producing lifelike features. From a mold of a human hand, for example, the plastic can transfer a tiny wart or a hangnail.

Molds for the hands of the figures in the Washington museum are first made in latex from the hands of friends or associates of





Plastic faces, like that of former President Harry Truman, above, are touched up with vinyl-base lacquers

the museum directors. The impression is then recast in a metal mold. The heads for most of the figures were first produced in clay by a Baltimore sculptor, Henry Berge. Plaster molds were made from the clay busts. In a few cases, plaster molds were made directly from the heads of persons associated with the museum.

Once the mold is ready, the method of producing the plastic skin is the same for either heads or hands. A small amount of the secret-formula vinyl, in liquid form, is poured into the mold and sloshed around so that it reaches every part of the surface. The plastic is then heated to cure it; more liquid vinyl is poured onto the first layer, heated, and so on, until the skin has been built up to the desired thickness.

The wax, which has a melting point around 150 degrees Fahrenheit, is added to the hand or head in the same way—sloshed around inside the plastic until the nec-

essary thickness is reached. As an added precaution against limp fingers or sagging jaws during a hot Washington summer, the museum is air-conditioned.

It takes about two days to produce the lifelike plastic features of one of the museum's figures from the molds. The hands, head and other body parts are made by a Baltimore firm, Dorothy S. Lynch Studios, which supplies mannequins for department-store show windows. The parts of the bodies the public doesn't see—the legs, torsos and upper arms—are assembled from ordinary papier-mache mannequins.

Flexing a Mannequin's Limbs

To put a figure in a kneeling or falling position for a famous scene, the papier-mache legs and arms are cut apart at the shoulders, elbows, hips or knees. When the joints are flexed to the proper angle, they are cemented with glass fiber and resin.

Even the hair, eyebrows and eyelashes are plastic. It's the same kind of fire-resistant hair used for doll wigs and comes in swatches called "skins." The plastic hair is manufactured in "standard" colors but the mannequin makers sometimes dye it to get a particular shade of grey.

For most of the historic figures, a skin



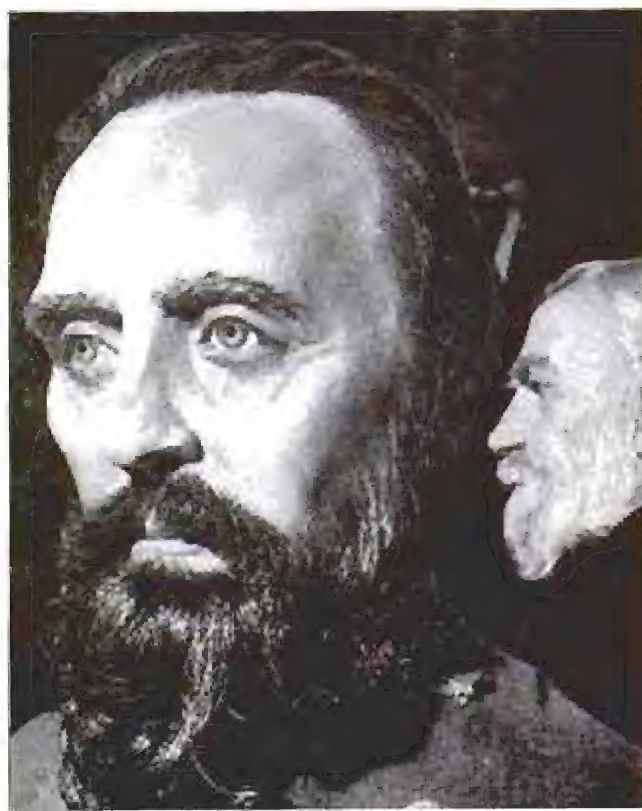
of the synthetic hair is glued to the vinyl scalp and individual strands are set in the head around the fringe of the wig to make the hair look natural. In the case of famous persons who lack a complete coif, like Winston Churchill or President Eisenhower, the plastic hairs are inserted one at a time with a special forked needle. The eyebrows, eyelashes and mustaches also are applied by individual strands.

Complexion of Lacquer

Complexion details, such as skin coloring, lips and unusual markings, are added with vinyl-based lacquers. Researchers for the museum found that Benjamin Franklin had a zig-zag shaped vein on his forehead, so a vein was produced on Franklin's modern plastic likeness. Abraham Lincoln's autobiographical sketch, displayed in the Library of Congress, describes his eye color, complexion, hair, and other physical details, but claims "no other marks or brands." The mannequin makers took no chances, however, and examined nearly 150 photographs of Lincoln before recreating the features of the Great Emancipator.

Washington's "wax museum" portrays the history of the United States in a series of tableaux starting with the discovery of America by a blond Columbus (researchers believe he came from Northern Italy). Visitors also witness the signing of the Declaration of Independence, Betsy Ross sewing the first flag, Davy Crockett at the Alamo, General Lee's surrender and the Yalta meeting of World War II—all captured in a vivid three-dimensional and life-size panorama of yesterday. ★ ★ ★

Features of General "Stonewall" Jackson and Andrew Carnegie are accurately reproduced in plastic



"Stick" Light Bulb Cuts Enlarger Size

Faster photoprinting speeds and smaller enlarging equipment will result from a new "stick" light bulb, according to General Electric engineers. The pencil-shaped bulb, 6½ inches long, produces a flat plane of light and a more uniform brightness over the negative. In use, the stick bulbs lie side by side. Because they are only ⅜-inch in diameter, photo enlargers using them can be up to 50 per cent shorter. The bulb uses 100 watts of power and has an expected life of 10 hours.

Bacteria Extract Metals From Waste Materials

Some bacteria have the ability to extract metals from waste materials or low-grade ores by changing the chemical composition. For example, germs can oxidize the sulphur in an ore, releasing free metal. Kennecott Copper Corporation scientists plan to use these microscopic organisms to recover a variety of metals that would otherwise be lost as waste. In fact, they are breeding strains of bacteria that can thrive in chemical solutions more than 100 times stronger than solutions that previously would have killed the strain. Special strains also are being developed for the recovery of metals, such as zinc, aluminum, magnesium and molybdenum.

☛ Latin America's first color television station opened recently with studios atop a new Havana, Cuba, hotel.



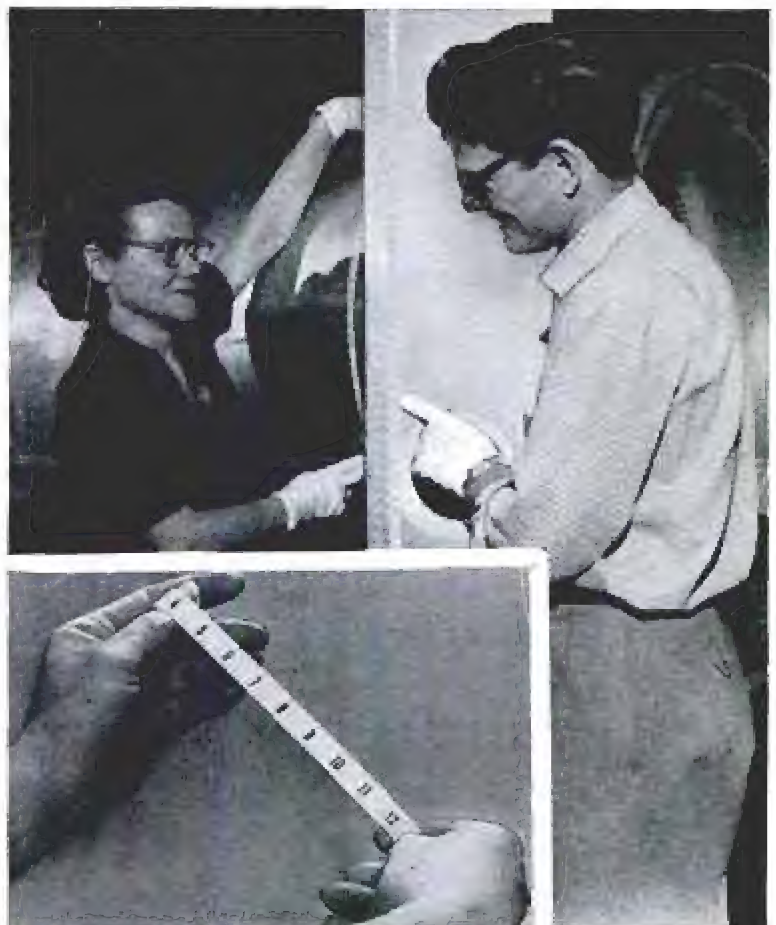
Pumping-heating unit, operated here by nurse, is connected to heating pad by plastic in and out-flow tubes

Heating Pad Circulates Warm Water Through Built-in Tubing

Intended to replace hot-water bottles, a plastic pad has a built-in network of tubing about $\frac{1}{8}$ inch in diameter. Warm water is circulated through the tubing by an electrically driven pump. Thermostats guard against overheating.

Stretchable Tape Measures Spot Welds

Elastic measuring tapes, once popular for practical jokes, now serve a serious purpose in the aircraft industry. At Northrop Aircraft, Inc., the stretchable tapes are used to indicate a series of equal spaces for spot welds or drilled holes. One side of a tape is graduated with calibrations $\frac{3}{4}$ in. wide. The reverse side of the tape has $\frac{3}{8}$ -inch graduations. The tapes can be stretched to more than twice their normal length and still give equal, proportionate readings. They can be used on straight or curved materials and on surfaces where specifications forbid marking.



Moving Day for a Hangar



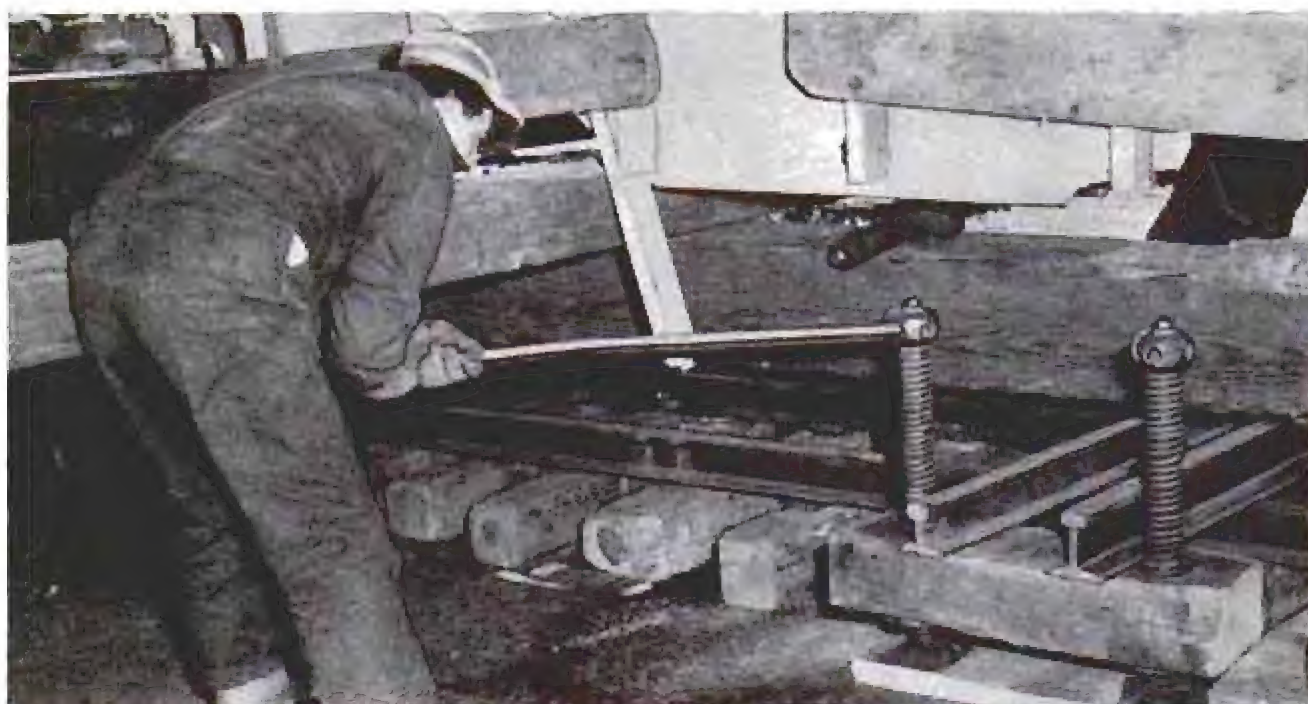
It took three months to move this huge hangar across airport at Bedford, Mass. Building weighs 800 tons

By Calvin Campbell

ONE OF THE BIGGEST buildings ever moved in this country was handled by a Massachusetts Yankee who never finished high school. The late Frank Goodwin was the dean of American building movers until his death early this year. He moved anything except furniture, and of that he always said, "I wouldn't move a chair out of a draft."

A huge airplane hangar at Hanscom Field in Bedford, Mass., was the trickiest job of his lifetime, and he was in the business 60 years with a record share of amazing assignments. The job called for moving 800 tons almost a mile while swinging it on an angle four times. The building, 237 by 165 feet, has an observation tower 75 feet high—the equivalent of a seven-story

Mover used 250 jacks to raise hangar to get sill underneath. Then jacks kept the rails level for traveling





Weighted tow trucks "on the mark" ready to take up slack in block-and-tackle system and get hangar moving

building—and the main hangar area and attached maintenance support shops rose three stories.

The Air Force wanted to eliminate a slight hill in the middle of the apron area and contracted to have the structure torn down. The East Coast Aviation Corporation asked to buy the hangar if they could move it to the civilian area of the field. Engineers had serious doubts that anything that large could be moved. It had no floor to hold it together. It was open on both ends. The proposed site was 3500 feet across a busy airport. There was even a water gully in the path.

Naturally the name B. F. Goodwin & Son was injected into the discussion. Frank Goodwin represented the "son" part of the company name since 1911. The Air Force and the civilian parties concerned all agreed that Frank Goodwin was the only man who could decide if such a feat were possible.

Frank studied the building carefully and announced: "I'll do it. Take me about three months, if the weather is right."

A regular crew of 20 men has been with the company for years. Each one is an expert, and they work in groups of four on a specific section of a building until the job is completed.

Two hundred and fifty heavy-duty jacks were used to raise the hangar building off the cement foundation, and huge 16 by 16 fir timbers, some 50 to 60 feet long, were lashed in place. Each upright was braced,

and crossties spiked across the bottom to take the place of a floor.

Fifty-six sets of steel rollers, four feet long and about four inches in diameter, were set on portable rails for the trip. Goodwin uses old trolley-car tracks because they tend to bend under great stress rather than break as railroad tracks are apt to do. The average length is 16 feet, placed in a broken line about three feet apart. The rail bed is built up of thousands of blocks and timbers to make it level regardless of the terrain. One dip or bounce and you are out of business.

Some days the hangar moved a noticeable 50, 60 and even 100 feet. Turning it took up considerable time since every set of rollers, every piece of track and the thousands of bed ties had to be shifted to the right angle.

The power for towing was provided by two winches with a normal pulling capacity of 5000 pounds. The company uses an extremely involved block-and-tackle system with innovations. With two "deadman" trucks carrying an extra five-ton weight, nine cables pass through the tackles another 18 times, multiplying the original power many times over, enough to move 800 tons. The pull is steady and evenly distributed to both sides of the building.

Engineers who have studied the Goodwin system and figured it out with a slide rule have expressed astonishment at Frank's uncanny ability to estimate when, where and how much to pull. He used to



Workmen use level to check tracks on which the hangar rides. Unless kept level, building would splinter



The late Frank Goodwin busy supervising his last and biggest job—moving the Bedford hangar. He specialized in moving big buildings, giant machines, wharves

explain it was "just something you have to know in this business."

In recent years he had refused jobs if more than a hundred miles from home, but he had worked all over the East Coast.

It was Goodwin who was asked to move the famous Salem Witch house and the antique Whipple house in Ipswich.

Nathaniel Hawthorne's birthplace is next on the company list. The 1630 house where the famous novelist assembled his notes for "The Scarlet Letter" is going to be moved a mile and a half to the estate of the House of Seven Gables to become a national literary shrine. Because of the extremely narrow streets in the old town, the house will have to be cut in half. The trustees insisted that Goodwin's company do the job.

Although Frank Goodwin will not be around to oversee the moving of the famous Hawthorne house, the techniques he perfected will be much in evidence. ★ ★ ★

Workmen adjust track bed for moving the hangar. Timber bed must be kept level regardless of the terrain





Voices of the Past Preserved in Antique Record Collection

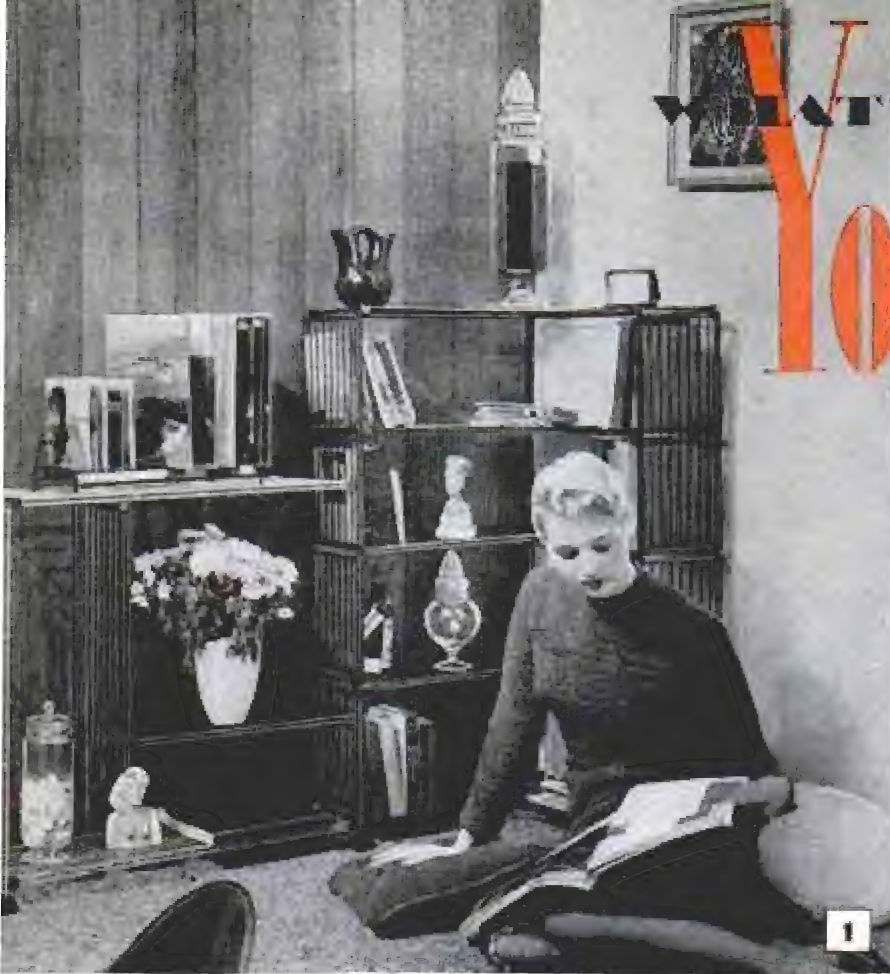


Theodore Roosevelt, William Jennings Bryan and Florence Nightingale are among personalities of past generations whose voices can be heard on recordings collected by Elmer Moore of Santa Monica, Calif. Moore's collection of voices and music, dating back almost 70 years, fills 10,000 cylinder records and 2000 disk records. Many of the recordings can be played only on antique phonographs and Moore also owns over 100 ancient Gramophones, including early American models.

Wires From Top of Post Hold Fruit Tree Limbs

Damage to fruit trees from strong winds or overloaded branches can be avoided with a patented device that gives a tree extra support. It consists primarily of a metal cap which rides at the top of a post. The post is sunk in the ground at the base of the tree and is clamped to the tree trunk with a strip of canvas or old garden hose. Guy wires or ropes are suspended from hooks around the cap and tied to the outer third of the main branches.

WHAT'S NEW FOR Your Home



1. PORTABLE SHELVES enable homemakers to design their own room dividers, bookshelves and hi-fi and TV stands. Combinations are made from four basic units that are available in matte black or brass-finished steel. Boltless, the panels are joined securely by the use of locking clips

Metropolitan Wire Goods Corp.,
230 5th Ave., New York City 1.

2. ADJUSTABLE HEADBOARD has sliding hinged cushions that flip forward and adjust at any angle. When not in use, the cushions are held upright in a scalloped frame of knotty pine, maple, blond or mahogany finish. The headboard can be attached to any Hollywood bed or box spring

Yield House, North Conway, N. H.

3. REMOVABLE MUNTIN BARS give new windows the appearance of divided panes while eliminating extra work during washing and painting. Bars are set into inside sash by ball-and-socket arrangement and are steel-pinned at intersections. They are removed in one piece

Boltscreen Company, ~~Pella~~ Windows, Pella, Iowa

4. SELF-REGISTERING THERMOMETER automatically registers the maximum and minimum temperatures of any given period, along with the current reading. Markers inside the two columns are forced to limits traveled by mercury and remain there to register extremes. Magnet resets markers

Harada, Inc., Kalamazoo, Mich.

5. JAR OPENER has concentric rings to fit all sizes of caps. Each ring is serrated to provide a nonslip grip on the cap. Made of Neoprene rubber, the cup-shaped opener is knurled on the outside to give the hand a sure grip. It is available in red, green, yellow and blue

W. L. Gill Co., 624 W. Citrus Ave., Redlands, Calif.





6. FRUIT PEELER cuts completely through skin around lemons, oranges, limes and grapefruit, then removes it in two unbroken sections. After skin is sliced by cutting edge located in middle of peeler, the pronged end is inserted underneath it. The prong peels off skin quickly while hand is rotating fruit. Resistant to acid, the peeler is made of stainless steel.
R. K. Plastics, P.O. Box 1101, Atlantic City, N. J.

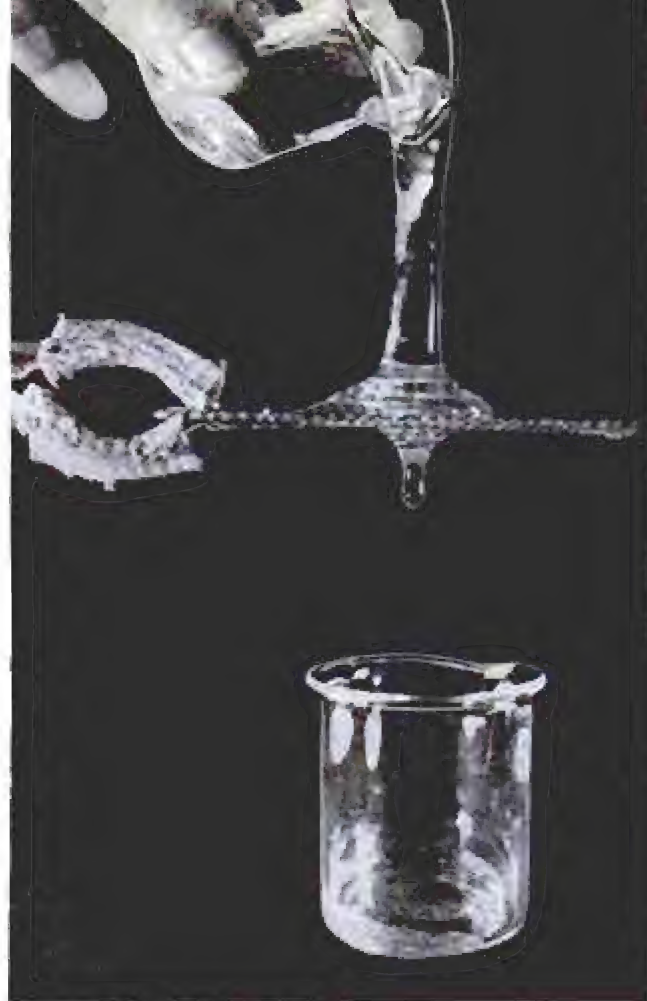
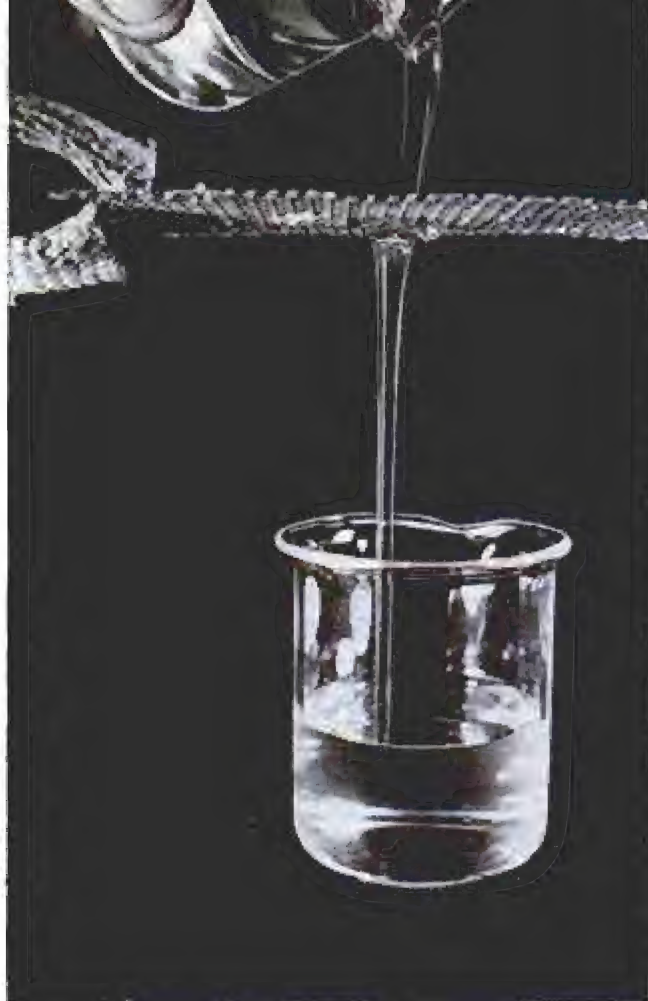
7. PORTABLE WASHING MACHINE can launder clothes in any receptacle that is at least seven inches deep. Able to do a four-pound wash in seven to ten minutes, the machine has molded nylon scrubbers that move up and down at the rate of 400 times a minute and tumble, agitate, aerate and scrub the clothes. The washer is insulated and waterproofed for safety.
A M I Inc., Grand Rapids, Mich.

8. BED LAMP directs beam of light exactly where reader wants it, enabling person on other side of bed to sleep undisturbed in surrounding darkness. Washable and adjustable to any angle, the lamp has a padded clamp to keep headboard from being scratched. Textured finish prevents overheating. Lamp comes in six colors: Ivory, pink, blue, maize, green, brown.
Pennington Crafters, Inc.,
3412 J St., Philadelphia 34, Pa.

9. VACUUM CLEANER is nonelectric and self-powered. It has a revolving fan that beats the floor covering, loosening particles of dust and bringing them to surface. Aided by static electricity it generates, the frictionlike action of fan creates a strong suction. The dirt and dust are pulled into the bag and gradually settle in the box at the bottom.
Harco International, Inc., Kalamazoo, Mich.

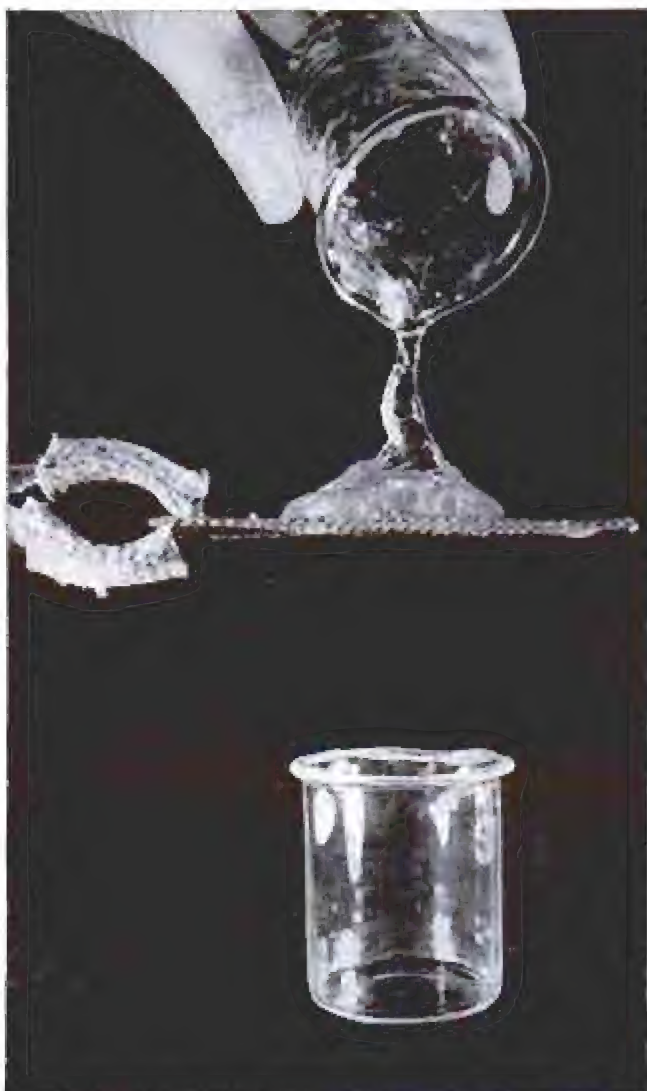
10. REMOTE-CONTROL RANGE allows homemaker to relax on patio or in living room without worrying about food on gas oven. She can turn oven on and off by operating remote-control box. Desired temperature for food is selected by pressing one of seven buttons on oven's backguard. They control three top burners. Fourth is thermostatically controlled.
Sunray Stove Co., Delaware, Ohio





Water Flows Like Molasses

DID YOU ever see water flow like molasses in January? By adding small amounts of cellulose gum, water may become thick enough to eat with a fork. Pure cellulose gum changes only the viscosity of water; it doesn't change water's chemical properties. Because it can make water stand still, cellulose gum is used as a thickening agent in toothpaste, as a water-binding agent in pie fillings and as an emulsion stabilizer in salad dressings and ointments. The photographs, from upper left to lower right, show low, medium and high-viscosity effects of adding cellulose gum to water. The screens are of the same gauge.



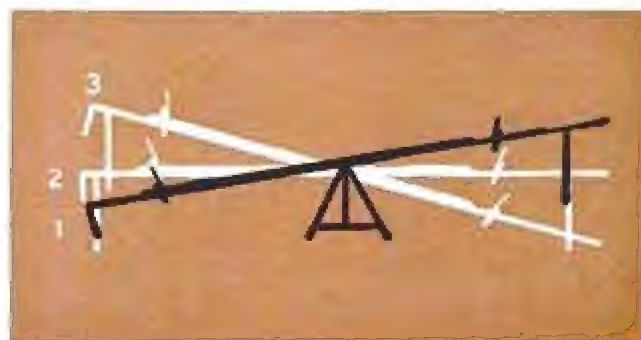
Photos by Bernard Hoffman for Hercules Powder Company

POPULAR MECHANICS



Portable Service Ramp Makes Car Lift Itself

Adjustable to various tread widths, including those of foreign cars, a portable automobile ramp requires no power to raise the car for servicing. Built like a seesaw, the all-steel ramp can be used in any of three positions (see diagram at right). Casters can be installed for portability.



Midget Portable Vacuum Cleaner Has Built-in Hair Dryer

Housewives in Germany can have a hair dryer along with their miniature vacuum cleaner. The section of the cleaner that contains the handle can be removed and used

to warm the air for hair drying. Particles of dust and dirt in the vacuum cleaner are prevented from entering the dryer. The machine operates on 130 watts.





National Reactor Testing Station photo

Sky scanner detects and tracks radioactive particles through the air, automatically recording its findings

An eminent physicist presents a plan for **DETECTING BOOTLEG NUCLEAR TESTS**

By Richard F. Dempewolff

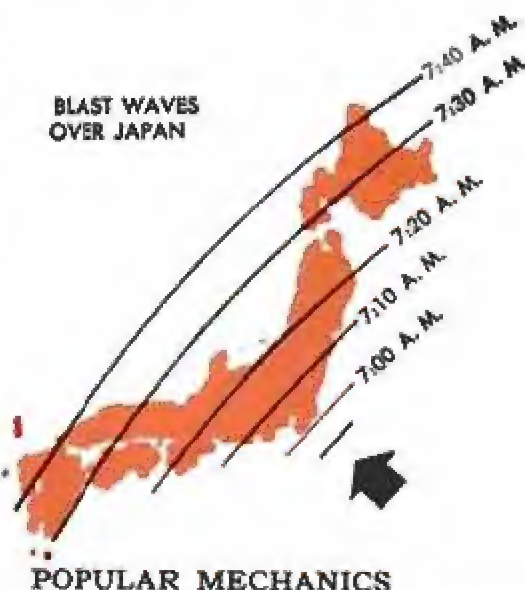
DR. JAY OREAR, a slight, unassuming Columbia University physicist who's been checking up on this country's eyes and ears, slid a map of Russia across his desk. On its blank surface, he had penciled in an array of carefully spaced circles.

"If we can make an agreement with Russia to set up detection stations inside that country," he said, "those locations—about 450 miles apart all over the U.S.S.R.—would make it possible for us to detect any nuclear bomb the Reds explode—except possibly the smallest conventional-bomb-size atomic devices. Even underground shots like our Nevada tests would show up. We'd know instantly where the shot was fired and how big it was."

Embarked on a special project for the university's Institute of War and Peace studies, Dr. Orear's job has been to investigate the possibility of devising a system for sniffing out nuclear explosions—even when great pains are taken to hide them. If the Soviets and Western powers agree to a nuclear-test ban, such a policing system will be vital to both sides. The big questions: Can it be done? And if so, how? Dr. Orear set out to learn the answers, and he's optimistic about what he found.

The fact is that for years, a highly secret "fence" of detection stations, and specially equipped planes cruis-

Map shows how microbarographs traced an abnormal wave of atmospheric pressure across Japan. From curves on map, scientists calculated where nuclear explosion originated





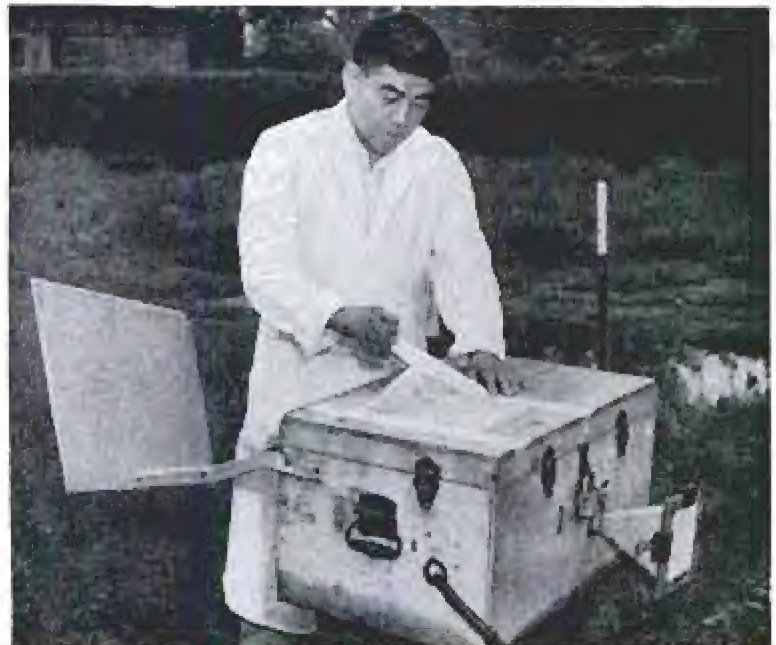
Thermal radiation from a bomb excites air particles, causing a glow that can be "seen" by photocells

ing daily along Russia's far-flung boundaries, has been putting the finger on Soviet A-tests with considerable efficiency.

Since it has always operated under a cloak of silence, not much has been told about this watchdog network—how it operates, where its stations are located or the techniques it uses. But a few hints have seeped out. Labeled "AFOAT"—an abbreviation for its Air Force office—Atomic Energy Commission command—the "snoop" operation is headquartered in an obscure building in Washington. Its F-84 and B-57 aircraft, equipped with long tubes and comblike scoops, fly through various levels of the atmosphere collecting samples of air which they bring back to be analyzed and tested for radioactivity. The 4926th Test Squadron in Nevada that samples "hot" clouds over our own nuclear-proving grounds is an AFOAT outfit. And it is no secret that AFOAT planes brought back the radioactive air samples that tipped us off to the Russians' first nuclear bomb in 1949.

Other devices AFOAT uses to sniff out Soviet atom secrets have never been revealed. But scientists know that ultrasensitive weather and earthquake-recording instruments have registered the shock of nuclear bombs hundreds—and sometimes thousands—of miles off. Other sensitive instruments that "see" and "hear" strange atmospheric phenomena associated only with nuclear blasts already are in use.

Up to this writing, undoubtedly using such devices as these, AFOAT has pinpointed at least 39



Like a windmill, the air sampler rotates on a tripod, always facing the wind. Air is drawn through funnel at right. In addition, sticky plastic sheet on top of box picks up fallout

Fiber filters and plastic sheets are removed every 24 hours and placed under a geiger counter for a count of radioactivity. This provides a check of airborne radioactivity each day



Series at right shows how fallout is measured on Eastern seaboard and could be measured at stations around the world. Plastic samplers are distributed and exposed to fallout. They then are collected and burned. Girl at right uses machine to embed ashes in plastic tape, as shown in center photo. The tape then is "played" through machine at far right, which counts radioactivity in each sample and records it



big nuclear bangs. All were detonated under total news blackout by Russian scientists at their proving grounds on the bleak Siberian steppes above the Arctic Circle or at Lake Baikal on the barren table lands of the southern Pamir. Last February 23, the first of a series of radioactive hydrogen-bomb clouds had barely mushroomed into the stratosphere above Siberia's arctic tundra before the network knew that a "big one" had blossomed. Within hours the blast had been located on Siberia's map. Its size had been precisely calculated. From invisible fallout that rained across the world for several days after the blast, experts not only determined what was in the bomb but how it was put together and fired. A few days later, when the Russians triggered two hydrogen bombs in a single day, the "eyes and ears" of AFOAT again put the blasts under the microscope, working with completely invisible evidence.

All this sounds good. But how about extremely high-altitude tests? How about small A-bombs that can be made to explode with no more *oomph* than a conventional weapon? How about underwater and subterranean shots? Some government officials think it might still be possible to hide such nuclear explosions. Not so, says Dr. Orear. An effective inspection grid could be set up, he believes, if those monitoring stations can be located deep inside Russia.

"Twenty-five stations are all we'd need," he says, "provided we also have well-equipped weather stations ringing the U.S.S.R., plus others in Greenland, the Aleutians and other points. To check up on Red integrity, Dr. Orear's detection stations would contain an array of instruments constantly measuring such things as bomb-sensitive air waves, ground waves, light waves and radioactivity in the atmosphere. Most of the gadgets are instruments you

Maps show Dr. Orear's plan for mutual-detection system, with stations necessary to detect bootleg tests





can find in any good observatory. The job they can do on "hidden" A-bombs, however, is startling.

One foolproof bomb-detection tool is the microbarometer. Often used in weather stations to measure changes in the atmosphere's pressure, this instrument has the ability to catch the faint wavering of air pressure, or "acoustic waves," caused by nuclear explosions. These pressure waves are detectable for incredible distances.

"Japanese microbarographs," Dr. Orear points out, "have registered blasts more than 5000 miles away. These pressure waves in the air are distinctive. They travel at the speed of sound and come in at a rate of about one wave per minute once they've left the immediate bomb area. You can't mistake them. Even ordinary barometers catch them sometimes."

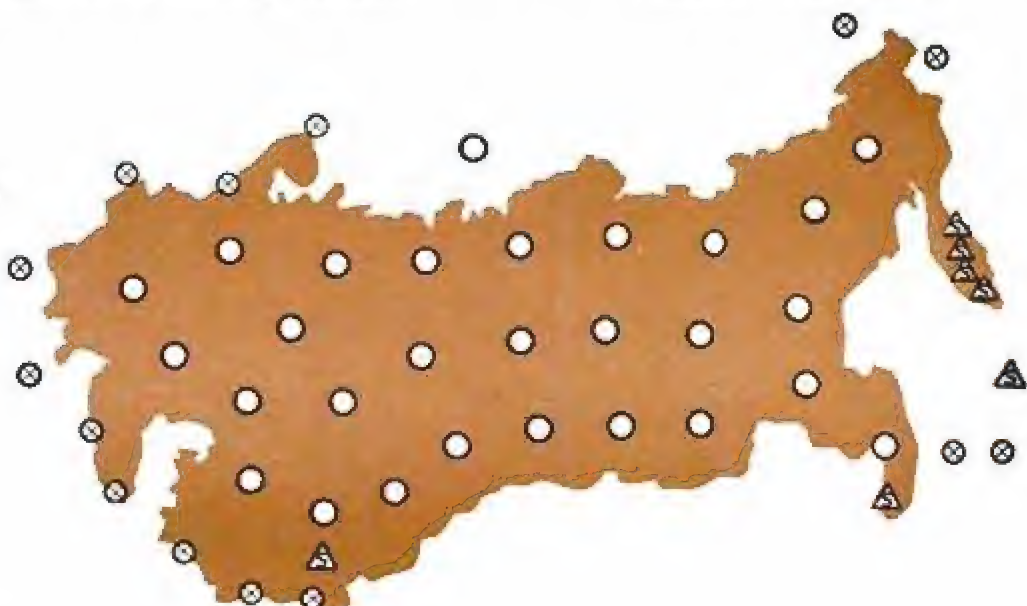
When our Bikini bomb of Mar. 1, 1954, was detonated, Japanese barometers picked up the pressure waves. The Russian test of Nov. 22, 1955, showed up on Jap weather

gear, too. Actually, even an ordinary mercury house barometer would register shock, but you'd need the eyes of a microscope to see it. The mercury column would only vary about .003 inch—too small to follow with naked eye. But under the supersensitive pen on a microbarograph's revolving drum it comes out in a long line of squiggly waves. By timing the waves and measuring their size, scientists not only can tell the location and time of the blast, but also can estimate the size of the bomb's yield in kilotons or megatons (the comparable blast effect of thousands or millions of tons of TNT).

Nuclear explosions kicked off underground dissipate most of their energy in the earth. Hence, they would send out no air-pressure waves that a microbarometer could "feel." The instrument would be a poor detective for such tests. But for long-distance detection of topside explosions, it's sure fire. Other instruments will catch the

(Continued to page 210)

U.S.S.R.





Solar Energy Powers Clock in Venezuela

Solar energy drives a unique clock at the University of Caracas in Venezuela. Atop a building nearby is a large plastic ball containing eight solar cells. The cells convert solar energy into electrical energy,

which then can be stored for as long as 100 days for operation at night and during prolonged cloudy periods. The electricity is used to hoist a balance weight of 52 pounds, which in turn drives the clock.

should be



Direction Finder Weighs 1½ Pounds

Boat skippers can be kept on the beam by a radio direction finder that weighs just 1½ pounds. Its accuracy is within one percent. Weatherproof and hermetically sealed, it is used with a battery-operated transistorized receiver said to be the first navigational receiver that does not use radio tubes.



Cutting Machine Grinds up Stumps

There's no longer any need to be stumped when you cut down a tree. A 36-horsepower cutting machine can straddle a six-foot stump and reduce it to sawdust in a few minutes. Armed with 24 cutters, 12 on each side of a 28-inch steel wheel, the machine can operate on stumps as low as 10 inches under the ground. A mesh shield around the cutters protects the driver from flying particles, yet gives him an unobstructed view of the cutting.

SEE
CORRECTION
SEPT
58
P. 12



Portable Loader Aids Air Force at Isolated Bases

To help the Air Force provide emergency service to isolated bases, a portable cargo loader has been designed for the Boeing KC-135 tanker-transport. Two electrically

driven combination hoist-and-carriage units move the load, and a rail system is used to carry and spot the load anywhere in the plane's cargo area.

Aluminum Ball-Shaped House Will Shelter Workers in Belgian Congo

Though the spherical object may look the part, it's not a diving bell headed for a deep-sea exploration. On the contrary, it's one of the latest steps in man's endless efforts to devise more suitable living quar-

ters. Inside the unorthodox house is a three-room layout. Made of aluminum, the structure was designed by Dr. Johann Ludovici of Germany especially to house workers in the Belgian Congo.

Up the Thames to a London housing exhibition goes the "ball home" before being shipped to the Congo



Want a Jet Plane? Build It Yourself

By Joseph Stocker

DOWN THE RUNWAY at Phoenix' municipal airport recently sped a jet airplane with a peculiarly unmilitary paint job of turquoise, white and black and a civilian registration number. As the plane arched into the sky, a 46-year-old man watching from the airport's observation deck let out a yelp of joy and relief.

For Robert V. Kamensky, the man on the observation deck, that take-off marked the successful culmination of 3½ years of work, sweat and hope. And for civilian aviation it marked a milestone. For the plane making its initial test flight was a T-33 that Kamensky had had constructed from spare parts and registered as the nation's first privately owned jet. (The T-33 is the two-seat trainer version of the Lockheed F-80 Shooting Star, granddaddy of United States jet fighters.)

It was in 1954 that Kamensky—a North Hollywood, Calif., dealer in aircraft spare parts—got the idea of building a jet.

"Being in the aircraft business," he says, "I get around the country and visit other people's warehouses. I began to notice quite a bit of T-33 material and realized I could put a whole plane together."

Kamensky started rounding up parts. He bought a wing and fuselage from a dealer in Las Vegas, Nev. The nose was obtained from an aircraft rebuilding firm in Los Angeles. Four or five engines were gathered so that the best parts could be put together into one Allison engine.

Kamensky's search took him all over the United States, to Alaska, Europe and North Africa. As word got around, letters came from parts dealers everywhere, offering bits of T-Birds. Says Kamensky: "All told, the parts in that airplane have come from 50 to 75 different locations."

Once he had all the parts, Kamensky loaded them aboard two trucks and hauled them to Phoenix, where two Air Force bases and an Air National Guard base are located. Kamensky reasoned that he could find skilled men there. And he did. John King, a maintenance supervisor at Luke Air Force Base, became project chief.

It took 3½ years and 20,000 man-hours to build the jet, and the undertaking cost Kamensky about \$100,000.



It took 3½ years and \$100,000 for Robert Kamensky, of North Hollywood, Calif., to build this jet, modeled after the T-33

"When we thought we had everything we needed, there were still about 40 parts missing," he says. "We'd stop six months at a time because we couldn't find parts."

While Kamensky flies small aircraft and even has a little C-47 time built up, he's no jet pilot. So he hired Robert Kanaga, a young Arizona rancher and National Guard jet flier, as test pilot. On the morning of the first flight, word got around that something special was happening, and the observation deck at Phoenix' Sky Harbor airport was crowded.

Kamensky Jet Needs Short Take-Off Run

Having been built without some 2000 pounds of military equipment normally put into Air Force T-33s, the Kamensky jet needed a much shorter take-off roll. Kanaga had it airborne in about 3000 feet. But he kept hugging the runway while he built up airspeed, so that if he flamed out, he'd have enough speed to go around and land. Kamensky, thinking something had gone wrong, muttered, "Get it up! Get it up!" and covered his eyes. When he uncovered them, it was just in time to see his jet "zoom up like a cork popping out of the water."

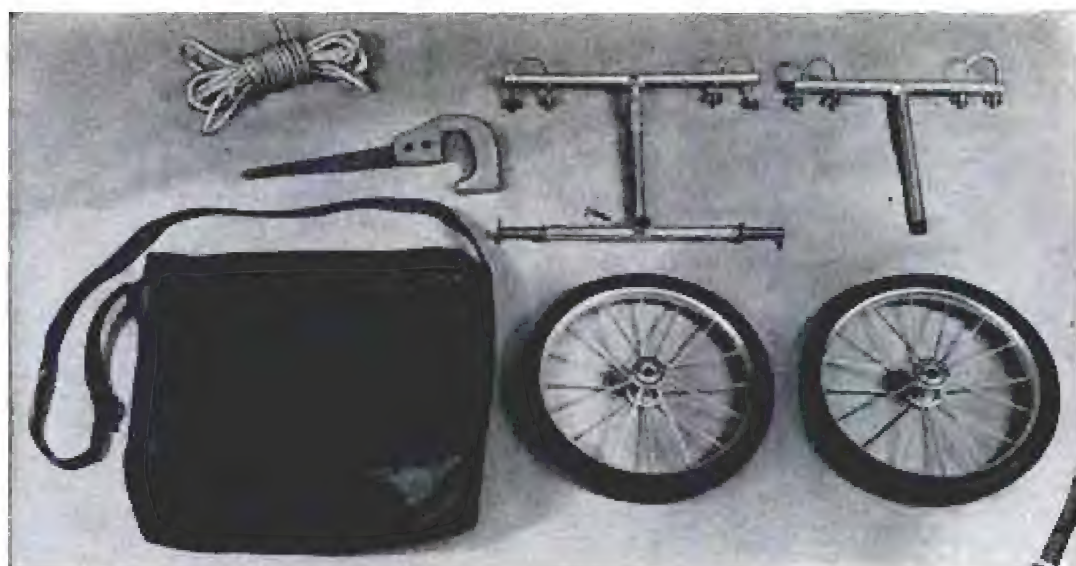
Kanaga clipped off 580 miles per hour on that first flight.

Kamensky went up in the T-33 the next day (his first ride in a jet) and then—regretfully—set about to sell it. "I haven't the money to run that plane," he said.

Even before it had flown, he had received a couple of dozen inquiries from potential purchasers. Asking price: Somewhere in the neighborhood of \$250,000.

Once he found a buyer, what did Kamensky plan to do next?

He grinned: "Build another jet."



Collapsible Cart Aids Hunters

Moving the carcass of a deer from the woods to the hunter's car is a simple matter if the hunter can roll the game animal out on a two-wheel cart. A cart kit available for hunters weighs only eight pounds and includes everything except the handles, which can be cut from tree boughs. A saw is included in the kit, which is carried in a rubberized bag slung from the shoulder. The deer is tied to the boughs with a length of rope, also included.



Niobium and Vanadium Found In Bodies of Sea Animals

Oceans eventually may be our major source of supply for niobium and vanadium. Scientists have found quantities of these metals in tiny sea animals. Niobium and vanadium are important in hardening high-quality steel and in making aircraft steels more useful at high temperatures.

It's a Bird, It's a Plane —No, It's a Water Tank!

Visitors to Caracas, Venezuela, may be startled by the sight of a four-engine airplane on the roof of one of the city's houses. But the plane doesn't fly. It's really a water-storage tank, which is a necessity for homes in some tropical cities. The tank holds 450 gallons.

Sliding Seat on Frame Helps Move Handicapped

Designed to help handicapped persons change position, a device invented by Chris Kakoska of Mesa, Ariz., is called a "portable escalator." The "escalator" consists of a sliding seat that moves back and forth on a metal frame that is 45 inches long. The device can be used to move a person from a wheelchair to a car or to a bed.



OWNERS
REPORT

A NATIONWIDE SURVEY

Lincoln Owners



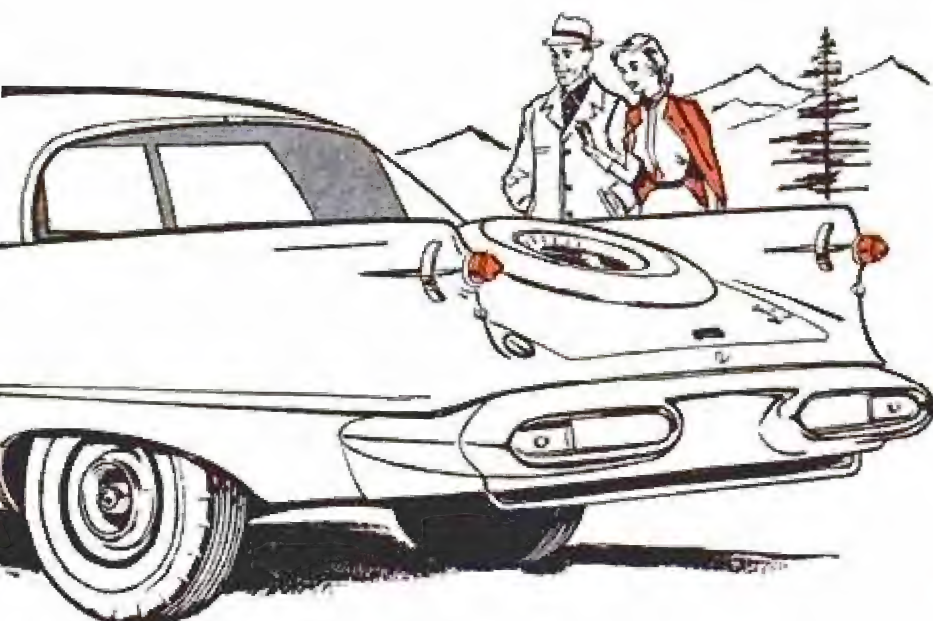
Imperial Owners

Which Jewel Is Brightest?

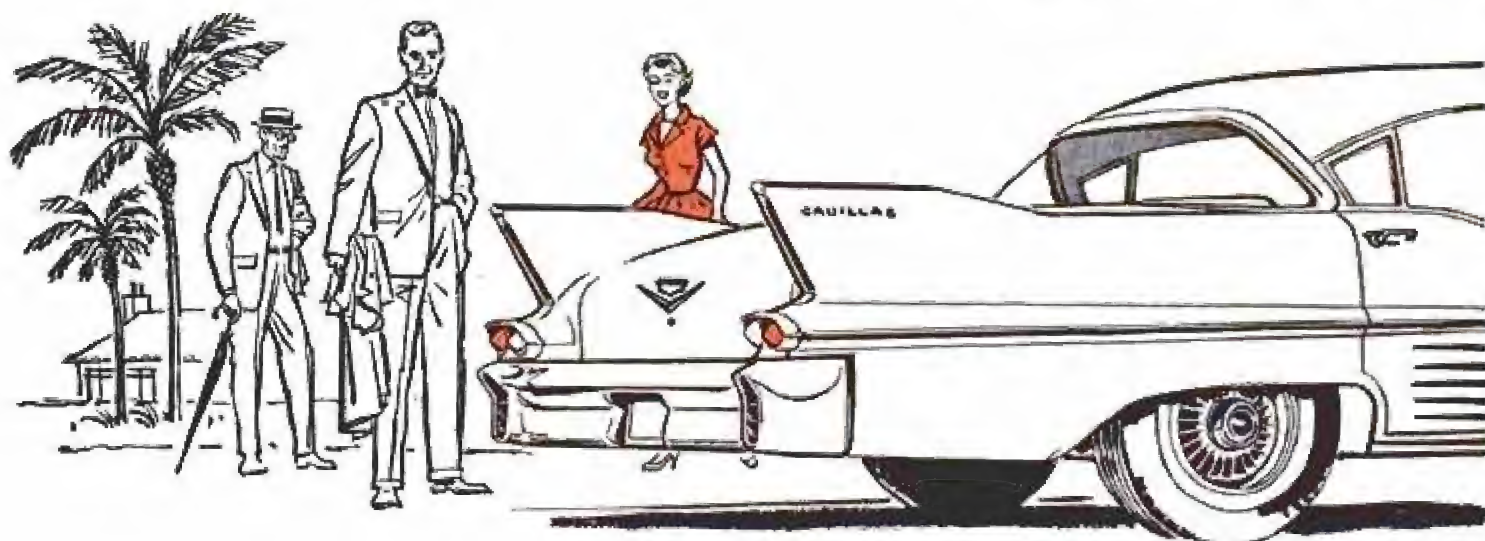
THESE ARE THE CARS with class, the Tiffany types. Their appeal is more mental than mechanical. You feel rich just climbing into one of them.

Owners rate Imperial a whisker over Cadillac in the Excellent rating. Lincoln falls far behind. But Lincoln is all-new. Its unit body presented production problems at first.

Lincoln assures PM these problems have been solved and current buyers are a much happier bunch.



Cadillac Owners



Rate Styling Its Best Feature

MARGINAL COMMENTS
BY ART RAILTON
PM's AUTO EDITOR

IT'S ALL NEW, this 1958 Lincoln, and the owners are high in praise of the new look. Styling is what they like most by a wide margin. Riding comfort and ease of handling place second and third on the list.

Popular Mechanics asked owners of 1958 Lincolns in 37 states what they like and dislike about their cars and here, in order of frequency of mention, is what they said:

"Prettiest and most sensational car that has ever been designed and built."—Maryland retired Army general.

"Fullest expression of classic design."—Ohio salesman.

"I like its appearance, no chrome."—Illinois executive.

"Gets more attention than any other make on the highway."—Texas salesman.

"Nicest riding car I have owned."—Kansas farmer.

"Comfortable ride on long trips."—Oklahoma agent.

"Just returned from a very comfortable trip to Miami.

(Continued to page 113)

Styling is a personal matter. Only one opinion counts—yours (unless you let your wife participate). A practical note: Lincoln's sheet metal forms a trough just under the window sills that collects water, dirt.

Say Ease of Handling Is Tops

MARGINAL COMMENTS
BY ART RAILTON
PM's AUTO EDITOR

IMPERIAL RETAINS ITS styling with only minor trim changes for 1958, styling which was so enthusiastically received last year. But this year, exterior styling places fourth in the best-liked list of 1958 owners. First on the list is handling ease with 54 percent mentioning it.

After handling ease comes riding comfort, followed by power and performance. Styling, roadability and torsion-bar suspension are next.

Here, in the words of owners of 1958 Imperials, are the reasons why they like their cars:

"The Imperial handles like a feather, so easy, so quick."—New Hampshire realtor.

"No other car, bar none (foreign makes included), handles anywhere near as well on the highway or can come

(Continued to page 115)

Delightful to drive. Steering is precise, wheel angle excellent. It has a lightness that is exhilarating—no sense of inertia. You feel it can turn, stop, start like a sports car—it can't, but you feel that it can.

Rate Riding Comfort First

MARGINAL COMMENTS
BY ART RAILTON
PM's AUTO EDITOR

THROUGH GOOD YEARS and poor ones, Cadillac keeps right on selling. Why? What is there about the car that enables it to outsell its rival three to one?

The Cadillac owners taking part in the PM survey place riding comfort, handling ease and exterior styling on the top of the best-liked list. But these alone can't be the reason for the Cadillac leadership in the fine-car field. There must be more to it than that.

Perhaps the overriding reason is the feature that ranks eighth on the list: Prestige. This feature rarely, if ever, appears on surveys of any other make, yet it regularly comes up in a Cadillac report.

Here's what the owners themselves have to say about their Cadillacs, in order of frequency of mention:

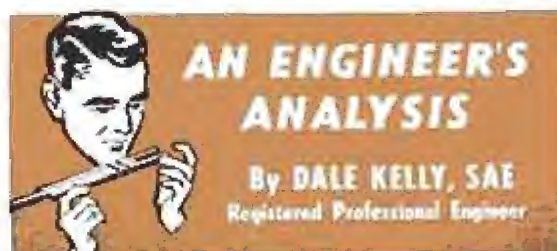
"Rides nice. On long trips it isn't tiring."—North Dakota banker.

"Returned today from a 3400-mile trip. Air suspension ride wonderful."—Iowa executive.

(Continued to page 117)

You can't separate Cadillac from prestige—it's part of the language. Do owners buy its quality? Or its class? Who can say?

Ride is soft. Excellent on boulevard. Tends to oscillate on undulating road (steel-sprung model, that is).



1958 LINCOLN TEST DATA

MODEL TESTED: 1958 Lincoln Capri four-door hard-top with four-barrel carburetor, dual exhausts, automatic transmission, power brakes, steering, seat and windows, plus air conditioning.

Rear-axle ratio: 2.875 to 1. Wheelbase: 132 inches (see Observations) Tires: 9.50 by 14. Weight: 5148 pounds with gas tank half full (55% on front wheels, 45% on rear).

Mileage on car at time of test: 2000 miles. Barometer: 29.04 inches. Temperature: 81 degrees F. Payload: 200 lb.

ACCELERATION TIME FROM STANDING START (in seconds)



Ignition timed for:	0 to 20	0 to 40	0 to 60	0 to 80	¼ mile
Regular gasoline.....	3.3	7.4	13.0	21.9	19.7
Premium gasoline.....	2.9	7.0	12.3	19.8	19.1
Super-premium gasoline.....	2.8	6.5	11.7	19.8	18.7

(All tests in D1 range. Gasoline had the following octane ratings by Research method: Regular 90; Premium 97, Super-premium 105.)

FUEL ECONOMY (miles per gallon)



Ignition timed for:	Steady 30 m.p.h.	Steady 50 m.p.h.	Steady 70 m.p.h.	Traffic Route
Regular gasoline.....	17.5	16.4	12.2	7.1
Premium gasoline.....	18.2	16.6	13.0	8.9
Super-premium gasoline.....	19.0	16.1	12.2	9.55

(All tests in D2 range. In traffic test, car makes 10 full stops per mile and is driven fast enough to average 15 miles per hour.)

ESTIMATED AVERAGE ANNUAL GASOLINE BILL: \$236 for 10,000 miles

(Based on a 50-50 use of premium and super-premium gasolines)

SPEEDOMETER ERROR (miles per hour)



Speedometer reading.....	20	30	40	50	60	70	80
True speed.....	20	29	38	47	56	66	76

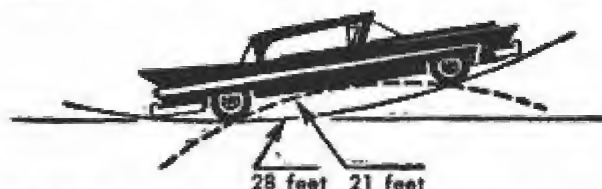
ODOMETER ERROR (miles traveled)

Odometer registered 103 miles for an actual distance of 100 miles.



DRIVER'S VISION

Driver could see part of road 17 feet in front of car, full width of road 24 feet in front of car.



GROUND CLEARANCE (unloaded car)

Worst dip that could be crossed.....28-ft. radius
Worst hump that could be crossed.....21-ft. radius
Deepest rut that could be negotiated.....7.5 in.
Curb clearance for door opening.....13 in.

MISCELLANEOUS

STEERING

Steering-wheel turns for 100-ft. circle.....0.75 turn
Curb-to-curb turn-circle diameter.....42.5 feet
Wall-to-wall turn-circle diameter.....45.5 feet
Steering-of wheels, lock-to-lock.....3.9 turns

CENTER OF GRAVITY: 22.5 inches

TRUNK CAPACITY

14 cartons (one cubic foot each)

WATER RESISTANCE: Excellent

Splash-pan test: No leaks. Ignition and brakes unaffected.

High-pressure test: No leaks. Ignition, brakes unaffected.

OBSERVATIONS

Speedometer dial excellent, but instrument not so accurate as it should be in a car of this price. Instrument panel has an ammeter, but oil-pressure gauge has been replaced by a warning light. There is also a "low fuel" warning light (in addition to a regular gas gauge). These lights and the park brake warning light should be much brighter to be of use in daytime.

Steering is fast and turn circles are no larger than those of many much smaller cars.

Acceleration was somewhat disappointing for a car rated, as the Lincoln is, at 375 horsepower. Because of its 10.5 to 1 compression, the car performed slightly better with advanced spark and super-premium fuel.

Power-brake reserve vacuum was enough to

provide two full applications with the engine dead.

The tank held 23.5 gallons of gas. When the car was allowed to run out of gas, the gas-gauge needle did not move from zero until three gallons had been pumped into the tank. There should be a more accurate gauge on a car of this quality. This inaccuracy means that when the needle is on zero you may have three gallons of gas or you may be down to your last pint. The last three gallons in the tank are the most important and it is here that the gauge should be most accurate.

Wheelbase measured 132 inches on test car, one inch more than the published figure of 131 inches given out by the factory. The reason for this discrepancy is not known.

Covered 900 miles on the first day."—New Jersey engineer.

"A real pleasure to drive. My wife is small—only five feet tall. At first she would not try to drive it. Now she tells everyone it drives and handles like a baby buggy."—Ohio restaurant owner.

"Just put 6000 miles on it to California and back. Drove as much as 750 miles per day, always rested and relaxed."—Ohio service-station owner.

"For a big car it handles with ease. Very maneuverable. Seems to have a short turn circle."—New York salesman. ←

Feels surprisingly small from behind the wheel, despite its bulk. A foot longer than Cadillac overall, it turns in a five-foot-smaller circle. Imperial's circle is even bigger than Cadillac's.

And They Complain, Too

As with most all-new cars, Lincoln has its troubles, more so than the other two makes surveyed which are only slightly changed from 1957.

Just about a fourth of the Lincoln owners have no complaints at all. To them, the car is perfect.

But nearly 30 percent of the owners complain of poor workmanship. Many are extremely vocal since they did not expect a prestige car to have this weakness.

Body noise and engine noises and troubles are second and third on the complaint list.

The following quotations describe the principal complaints in order of frequency of mention by the owners:

"Some of the trouble is due to the normally expected defects in the first few thousand production models of a radically redesigned automobile. However, I feel that Lincoln has been negligent in not enforcing quality control. Front-wheel bearing burned out, rear shocks broke off, power steering leaked, windshield had to be reseated and other complaints."—Illinois real estate operator.

"There hasn't been a single week go by since I bought the car (and I have 4300 miles on it now) that it hasn't been in the shop for one reason or another. Nothing serious. Just a lot of little things."—Florida businessman.

"Too many rattles and squeaks."—New York teacher.

"Haven't been able to eliminate rattles which shouldn't be in a unit body."—Minnesota investment man.

"Engine stalled constantly. When this was corrected, the engine knocked loudly. When knock was reduced, it stalled again. Choke valve repeatedly stuck. Caused serious trouble and embarrassment. Seems okay now."—New York physician.



LINCOLN DASHBOARD DIALS LOOK AS PRECISE AS A MICROMETER, BUT THE CLOCK FACE IS UNREADABLE

← *Lincoln says these faults have been corrected and current cars are all right. It's a shame that early buyers must pay a penalty. They pay the most, are most enthusiastic, usually most loyal. Yet they are expected to put up with early production troubles.*

← *Unit bodies usually have fewer rattles, more road and engine noises. Lincoln has more of both. However, by normal-car standards, it's quiet. Only by luxury-car standards is it noisier than it should be.*

(Continued to page 218)

SUMMARY OF LINCOLN OWNERS' OPINIONS:

OVER-ALL RATING: Excellent 67.5% Average 15.6% Poor 16.9%

Best-liked features

Exterior styling.....	51.8%
Riding comfort.....	36.6%
Handling ease.....	28.0%
Power, performance.....	23.8%
Roominess.....	16.5%
Heavy, safe feeling.....	6.1%

Most-frequent complaints

None at all.....	24.4%
Poor workmanship.....	29.3%
Body rattles, squeaks.....	17.7%
Engine noise, troubles.....	15.8%
Radio, antenna trouble.....	14.0%
Faulty shock absorbers.....	10.4%
Heater trouble.....	7.9%

Had trouble with engine?

No trouble.....	52.8%
Some trouble.....	28.6%
Considerable trouble.....	18.6%

What was engine trouble?

Engine noisy, knocks.....	11.6%
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Carburetor trouble.....	9.1%
Stalling.....	7.3%
Poor, uneven idling.....	7.3%

Like the unit body?

Yes, like it.....	62.8%
Don't like it.....	4.9%
Don't know, no answer.....	32.3%

How is dealer service?

Excellent.....	48.8%
Average.....	27.1%
Poor.....	24.1%

Would buy from him again?

Yes, would.....	33.5%
No, would not.....	24.4%
Undecided, no answer.....	42.1%

What make was traded?

Lincoln.....	44.5%
Cadillac.....	13.4%
Other GM make.....	17.0%
Other Ford Motor make.....	9.8%

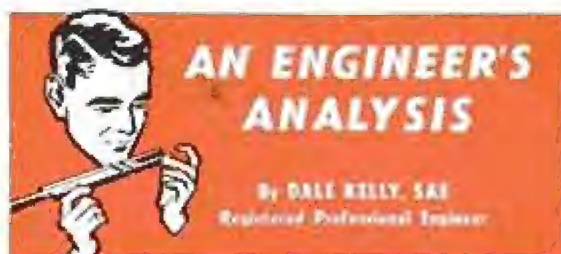
Chrysler.....	4.3%
All other makes.....	4.9%
No trade, no answer.....	6.1%

What make will buy next time?

Another Lincoln.....	48.8%
Cadillac.....	11.0%
Other GM make.....	3.0%
Other Ford Motor make.....	3.0%
Chrysler Corp. make.....	1.2%
All other makes.....	1.8%
Undecided, no answer.....	31.2%

What other car owned?

Another Lincoln.....	4.3%
Other Ford Motor make.....	36.6%
Cadillac.....	2.4%
Other GM make.....	20.7%
Chrysler Corp. make.....	7.3%
Other U. S. car.....	8.5%
Foreign car.....	6.1%
None, no answer.....	23.6%



1958 IMPERIAL TEST DATA

MODEL TESTED: 1958 Imperial Crown four-door hardtop with four-barrel carburetor, dual exhausts, automatic transmission, power brakes, steering, seat and windows, plus air conditioning.

Rear-axle ratio: 3.15 to 1. Wheelbase: 129 inches. Tires: 9.50 by 14. Weight: 5295 pounds with gas tank half full (56 percent on the front wheels, 44 percent on rear).

Mileage on car at time of test: 1500 miles. Barometer: 29.34 inches. Temperature: 69 degrees F. Payload: 200 lb.

ACCELERATION TIME FROM STANDING START (in seconds)



Ignition timed for:	0 to 20	0 to 40	0 to 60	0 to 80	1/4 mile
Regular gasoline.....	2.5	5.7	11.1	18.5	18.35
Premium gasoline.....	2.5	5.7	10.9	18.55	18.3
Super-premium gasoline.....	No improvement				

(Gasoline used had the following octane ratings by Research method: Regular 90; Premium 97; Super-premium 105.)

FUEL ECONOMY (miles per gallon)



Ignition timed for:	Steady 30 m.p.h.	Steady 50 m.p.h.	Steady 70 m.p.h.	Traffic Route
Regular gasoline.....	16.3	14.7	12.9	8.3
Premium gasoline.....	16.7	14.7	12.1	8.0
Super-premium gasoline.....	Not tested (see Observations below)			

(In traffic test, car makes 10 full stops per mile and is driven fast enough to average 15 miles per hour.)

ESTIMATED AVERAGE ANNUAL GASOLINE BILL: \$237 for 10,000 miles

(Based on use of regular by 75% and premium by 25% of owners)

SPEEDOMETER ERROR (miles per hour)



Speedometer reading.....	20	30	40	50	60	70	80
True speed.....	21	31	41	50	60	69	79

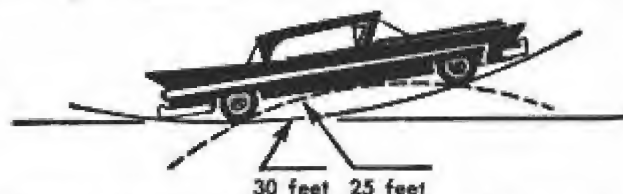
ODOMETER ERROR (miles traveled)

Odometer registered 99 miles for an actual distance of 100 miles.



DRIVER'S VISION

Driver could see part of road 18 feet in front of car, full width of road 22 feet in front of car.



GROUND CLEARANCE (unloaded car)

Worst dip that could be crossed.....30-ft. radius
Worst hump that could be crossed.....25-ft. radius
Deepest rut that could be negotiated..... 7.0 in.
Curb clearance for door opening.....13 in.

MISCELLANEOUS

STEERING

Steering-wheel turns for 100-ft. circle.....0.80 turn
Curb-to-curb turn-circle diameter.....48.5 feet
Wall-to-wall turn-circle diameter.....51.5 feet
Steering-wheel turns, lock-to-lock.....3.4 turns

CENTER OF GRAVITY: 23 inches

TRUNK CAPACITY

12 cartons (one cubic foot each)

WATER RESISTANCE: Good

Splash-pan test: No leaks. Brakes only slightly affected.

High-pressure test: Slight leakage tops of two doors.

OBSERVATIONS

The instrument panel carries a full set of five pointer-type instruments. Readability at night is excellent (in daytime also) because the instruments have special markings illuminated with "black" light. This light is not itself visible, but it makes the markings on the dials glow distinctly without any glare whatever. Speedometer extremely accurate in the important 40 to 70 range.

Accessibility in the engine compartment is poor. The ignition-timing adjustment is very hard to reach. You can't check the fluid level in the automatic transmission without removing the air cleaner and you can't do this without tools.

The car needs several feet more street width to complete a U-turn than other cars of its size.

Because no improvement in acceleration was

noted with the spark advanced for super-premium fuel, there is no reason for using this extra-cost gasoline. Therefore, no fuel-consumption test was made with super-premium gas. Actually, as the test data shows, there is little reason for using anything but regular gasoline in this car until it becomes badly carboned.

Power-brake reserve vacuum was enough to provide two full applications with the engine dead.

The gasoline tank held 23 gallons. When the car was allowed to run out of gas, the gas-gauge needle moved off the zero mark with less than a gallon being added to the tank. This is a desirable feature as you know that when the needle points to Empty you must refuel immediately.

anywhere close to cornering as well as Imperial. It is in a class by itself. It will corner comfortably at 110 miles per hour where other cars will do no better than 80."—Minnesota executive.

"Most comfortable riding car I ever had the pleasure of driving."—Wisconsin retailer.

"Has easy, firm ride which does not wallow and wander in corners."—Oregon landlord.

"Accelerates fast."—Pennsylvania dentist.

"Has a 'live' feeling found in no other automobile."—California fire captain.

"I like the long, low look."—Washington foreman.

"Styling and appointments generally indicate good taste on the part of the designers."—Illinois manager.

"Roadability. No sway on any curve."—California retired owner.

"Torsion-bar suspension is great. Big, powerful, capable car that won't make you nervous when you push it around some sharp turns and over rough patches. On high-crowned roads it has no tendency to wander."—Maryland foreman.



IMPERIAL'S DASH IS SIMPLE. ROUND DIALS ARE BIG AND HAVE EXTREMELY READABLE LEGENDS

Here Are the Complaints

Almost 40 percent of the Imperial owners have no complaints at all about their cars. The others do, however, and the one that is mentioned most frequently is poor workmanship (a fault that seems to be chronic in the industry).

"Too much poor workmanship on fine details. Too much finishing left to incompetent dealers with no facilities or poor help. Torsion-air advertising is misleading."—California flight test engineer.

"Body thrown together. Doors improperly fitted. Hardware of poor quality."—California physician.

Second on the complaint list is the extreme lowness of the car and the resulting difficulty getting in and out. After that come body rattles, electrical troubles, poor paint and chrome and the inconvenience of the push-button shift, in that order.

"Decidedly too low for my passengers to get in and out of car. Too low for me, too."—Pennsylvania owner.

"Headroom too small for a large man. Seat is set to recline and is hard on my back on long trips. My '56 was more comfortable."—Illinois contractor.

"Rear set too low and car has too many rattles."—Florida merchant.

← *Fine road car. Long trips at high speeds are a pleasure on straight or winding roads. Excellent road sense. You don't have to "drive" constantly.*

← *There's no excuse for a poor body job in a car costing as much as an Imperial, especially when this is the second year for the body. Lincoln has the "first year" excuse. Imperial has not.*

← *Hardest of the three to enter and leave. Test car did not rattle. Front seat does not support accelerator leg adequately. On long trips this may be tiring to driver, but passengers will enjoy a smooth, relaxed ride.*

(Continued to page 222)

SUMMARY OF IMPERIAL OWNERS' OPINIONS:

OVER-ALL RATING: Excellent 82.5% Average 12.7% Poor 4.8%

Best-liked features

Handling ease	54.1%
Riding comfort	47.3%
Power, performance	32.6%
Exterior styling	24.0%
Roadability	16.3%
Torsion-bars	5.4%

Most-frequent complaints

None at all	39.2%
Poor workmanship	15.5%
Too low, hard in, out	15.5%
Body rattles, squeaks	7.0%
Electrical trouble	6.2%
Poor paint, chrome	5.4%
Push-button shift	5.4%

Had trouble with engine?

No trouble	86.3%
Some trouble	11.3%
Considerable trouble	2.4%

What was engine trouble?

Carburetor	4.7%
------------	------

Starting trouble	2.3%
Engine noisy	2.3%

How is dealer service?

Excellent	61.2%
Average	27.3%
Poor	11.5%

Would buy from him again?

Yes, would	48.1%
No, would not	8.5%
Undecided, no answer	43.4%

What make was traded?

Imperial	22.5%
Other Chrysler make	27.1%
Cadillac	17.8%
Other GM make	16.3%
Ford Motor make	5.4%
All other makes	3.1%
No trade, no answer	7.8%

What make will buy next time?

Another Imperial	51.2%
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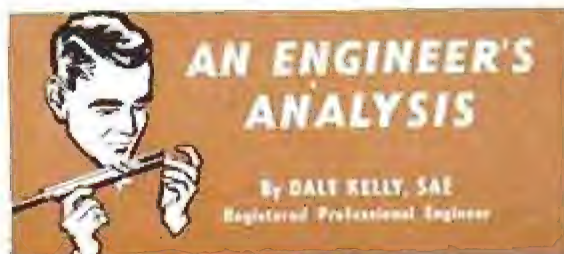
Chrysler	11.6%
Other Chrysler make	0.8%
Cadillac	5.4%
Other GM make	2.3%
Ford Motor make	1.6%
Undecided, no answer	27.1%

Have ever owned a Cadillac?

Yes, have	48.8%
No, have never	47.3%
No answer	3.9%

What other car now owned?

Chrysler	7.0%
Other Chrysler make	17.0%
Cadillac	3.1%
Other GM make	12.4%
Ford Motor make	10.1%
Other U.S. car	4.7%
Foreign car	1.5%
None, no answer	44.2%



1958 CADILLAC TEST DATA

MODEL TESTED: 1958 Cadillac Series 62 four-door hardtop with four-barrel carburetor, dual exhausts, automatic transmission, power brakes, steering, seat and windows, air suspension and air conditioning.

Rear-axle ratio: 3.36 to 1. Wheelbase: 129.5 inches. Tires: 8.20 by 15. Weight: 5128 pounds with gas tank half full (55½ percent on front, 44½ percent on rear). Mileage on car at time of test: 4350 miles. Barometer: 28.98 inches. Temperature: 80 degrees F. Payload: 200 lb.

ACCELERATION TIME FROM STANDING START (in seconds)



Ignition timed for:	0 to 20	0 to 40	0 to 60	0 to 80	¼ mile
Regular gasoline.....	3.4	7.3	13.3	21.9	19.9
Premium gasoline.....	3.2	6.6	12.4	21.2	19.4
Super-premium gasoline.....	No improvement				

(Gasoline used had the following octane ratings by Research method: Regular 90; Premium 97; Super-premium 105.)

FUEL ECONOMY (miles per gallon)



Ignition timed for:	Steady 30 m.p.h.	Steady 50 m.p.h.	Steady 70 m.p.h.	Traffic Route
Regular gasoline.....	19.1	15.4	13.2	7.7
Premium gasoline.....	20.2	15.1	12.55	7.8
Super-premium gasoline.....	Not tested (see Observations below)			

(In traffic test, car makes 10 full stops per mile and is driven fast enough to average 15 miles per hour.)

ESTIMATED AVERAGE ANNUAL GASOLINE BILL: \$245 for 10,000 miles

(Based on all cars using premium gasoline)

SPEEDOMETER ERROR (miles per hour)



Speedometer reading.....	20	30	40	50	60	70	80
True speed.....	21	31	40	50	60	69	79

ODOMETER ERROR (miles traveled)

Odometer registered 101 miles for an actual distance of 100 miles.



DRIVER'S VISION

Driver could see part of road 20 feet in front of car, full width of road 23 feet in front of car.



GROUND CLEARANCE (unloaded car)

Worst dip that could be crossed...26-ft. radius*
Worst hump that could be crossed 24-ft. radius*
Deepest rut that could be negotiated..... 7.0 in.
Curb clearance for door opening.....13 in.

* See Observations below

MISCELLANEOUS

STEERING

Steering-wheel turns for 100-ft. circle 0.80 turn
Curb-to-curb turn-circle diameter.....47 feet
Wall-to-wall turn-circle diameter.....49 feet
Steering-wheel turns, lock-to-lock.....3.7 turns

CENTER OF GRAVITY: 19 inches

TRUNK CAPACITY

13 cartons (one cubic foot each)

WATER RESISTANCE: Fair

Splash-pan test: No leaks. Brakes only slightly affected.

High-pressure test: Leakage at tops of all doors.

OBSERVATIONS

Speedometer scale has been straightened out and as a result the five-mile-per-hour intervals in the middle range (where most driving is done) are very small. Excessive chrome impairs visibility of entire panel.

With air suspension at maximum height (a separate control is used to elevate it above normal height) the radius of the worst dip drops to 19 feet, and the worst hump drops to 14 feet. This is excellent clearance. With air suspension at normal height, clearance was fair under rear overhang and relatively poor amidships. Deepest-rut clearance is normally determined by the differential housing and cannot be increased by changing air-suspension height. However, with the engine dead and the air bags deflated, the front end dropped so low that a rut deeper than three inches would have stopped the car.

Because no acceleration improvement was noted with the spark advanced for super-premium fuel, there is no reason for using this extra-cost gasoline. Therefore, no fuel-consumption test was made with it. During full-throttle acceleration above 60, there were signs of vapor lock on two different commercial gasolines. The time to 80 m.p.h. might have been a little better in cooler weather or with a less volatile gasoline.

In spite of poor gasoline mileage in traffic, the over-all gasoline bill was no more than the average for the Chevrolet, Ford and Plymouth cars tested a few months ago.

Power-brake reserve vacuum was enough for three full applications with the engine dead.

Gasoline tank holds 20 gallons. When the car was allowed to run out of gas, a little more than a gallon was required to move the pointer.

"Handles well in city traffic. More like a small car."—Louisiana Chevrolet dealer.

"Easy handling. Easy to park, power steering greatly improved."—California property owner.

"Styling. The car draws many glances and comments from people. When stopped for gas, drivers of other cars start asking questions. Neatest and best-looking car on the road."—New York physician.

"Long, smooth profile, beautiful colors."—Illinois housewife.

"No excessive flares."—Michigan foreman.

"Each line and feature reflect expert craftsmanship."—Michigan executive.

But Cadillac Is Not Perfect

Although a high percentage of Cadillac owners make no complaints at all about their cars (44.6 percent), the majority mention a few bad features. First on the complaint list is poor workmanship, followed by poor gasoline economy and body noises. Here are quotations describing these troubles:

"Not meticulous in final inspection. There is always a series of minor adjustments. Nothing serious, just annoying."—California executive.

"My first Cadillac. It should have been a dream car, especially for the price. But, alas and alack, it wasn't put together as well as the car I traded."—Maine salesman.

"Low gas mileage. It averages 9 miles per gallon in city (I got 11 and 12 on previous Cadillacs)."—Ohio chemical research director.

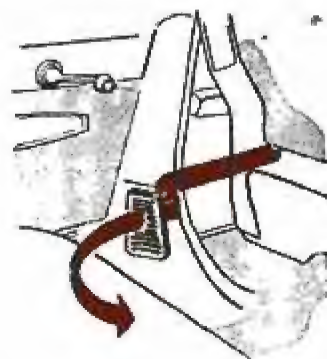
"I would like more gas mileage. I wish I could get two more miles per gallon (I get 14 on long trips)."—Texas salesman.

"No gas mileage. Have had it in the shop one third of the time since December 15th. They can't seem to do anything about it. I get 8 miles per gallon in the city."—Oregon club operator.

"A car costing \$7000 should be engineered for quietness. All my Cadillacs (this is the 4th) rattle like a truck."—Texas investor.

"Car is not prechecked for body rattles and squeaks. It must be brought in time and again on the same complaints."—Illinois lawyer.

(Continued to page 226)



CADILLAC PIPES HOT AIR INTO REAR SEAT VIA A DUCT INSIDE DOOR AND A CENTER-POST GRILLE

Always the same complaint! Certainly some way can be found to catch production faults on a \$7000 car before the customer finds them.

For years Cadillac owners bragged that they got more miles per gallon than small-car owners. The honeymoon seems to be over at last.

Test car had no rattles. In fact, its main virtue was its absolute quietness. It was much quieter, both in engine and road noise, than either of the other two cars. He must use his Cadillacs to round up the cattle.

SUMMARY OF CADILLAC OWNERS' OPINIONS:

OVER-ALL RATING: Excellent 80.9% Average 17.3% Poor 1.8%

Best-liked features

Riding comfort	46.4%
Handling ease	40.2%
Exterior styling	21.4%
Power, performance	20.5%
Heavy, safe feeling	8.9%
Quiet, smooth running	6.3%
Prestige	5.4%

Most-frequent complaints

None at all	44.6%
Poor workmanship	14.3%
Poor gas economy	13.4%
Body rattles, squeaks	11.6%
Engine noise, trouble	3.6%
Brake trouble	3.6%
Rear-view mirror location	3.6%
Poor acceleration	3.6%
Had trouble with engine?	
No trouble	89.1%
Some trouble	8.2%

Considerable trouble

What was engine trouble?	2.7%
Carburetor	2.7%
Valve trouble	1.8%
Oil leaks	1.8%
How is dealer service?	
Excellent	60.7%
Average	30.4%
Poor	8.9%
Would buy from him again?	
Yes, would	36.6%
No, would not	8.0%
Undecided, no answer	55.4%
Have optional air suspension?	
Yes, have it	16.1%
No, do not	76.8%
No answer	7.1%
Is air suspension worth price?	
(asked of those with it)	
Yes, it is	3.6%
No, it is not	1.8%

No answer, undecided

What make was traded?	10.7%
Cadillac	73.3%
Other GM make	8.0%
Ford Motor make	7.1%
Chrysler Corp. make	1.8%
No trade, no answer	9.8%
What make will buy next time?	
Another Cadillac	75.9%
Other GM make	0.8%
Ford Motor make	6.3%
Chrysler Corp. make	4.5%
Undecided, no answer	12.5%
What other car now owner?	
Another Cadillac	8.0%
Other GM make	42.9%
Ford Motor make	14.3%
Chrysler Corp. make	5.4%
Other U.S. car	3.6%
Foreign car	2.7%
None, no answer	30.4%



Ski Jump for Divers

RAPIDLY GAINING enthusiasts among outdoor-sports fans in the northern European countries is water-ski jumping. The water-ski jump was developed in Finland so that members of the Finnish Olympic team could train for winter ski competition during the warm summer months. But the skiers enjoyed the cool wet plunge at the end of each practice jump and what started as a training exercise quickly mushroomed into a popular summer sport. The water-ski jump structure is similar to those used for snow skiing, but the jumping boards are covered with paraffin. ★ ★ ★

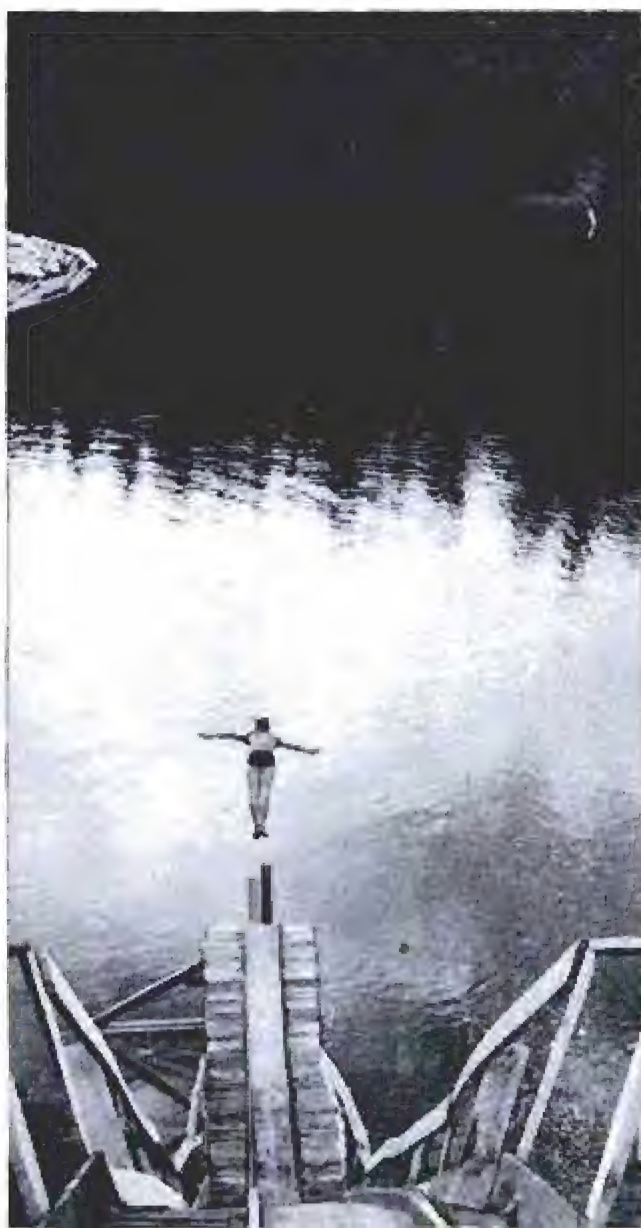




Water-ski diving requires both skill and courage but the sport is rapidly gaining fans in Scandinavia

Pose and movement in water jumping are similar to snow skiing, but skis are dropped as jump starts

Skiers descend rapidly on the jumping board which has been covered with a layer of smooth paraffin





All set to be the target of antiaircraft fire, a shiny drone awaits launching on the USS *Catapult*

The Navy's Smallest Aircraft Carrier



Should any of the planes escape the fury of the big guns, they parachute into the sea and are retrieved by the *Catapult*

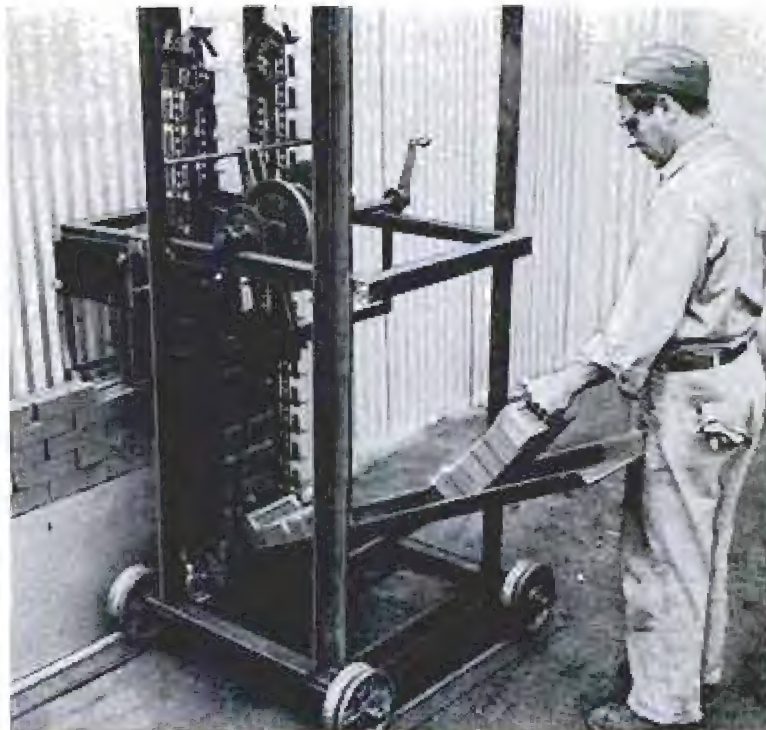
The *Catapult* carries 5 officers, 47 enlisted men and 11 drone mechanics. Its sister ship launches drones in the Atlantic



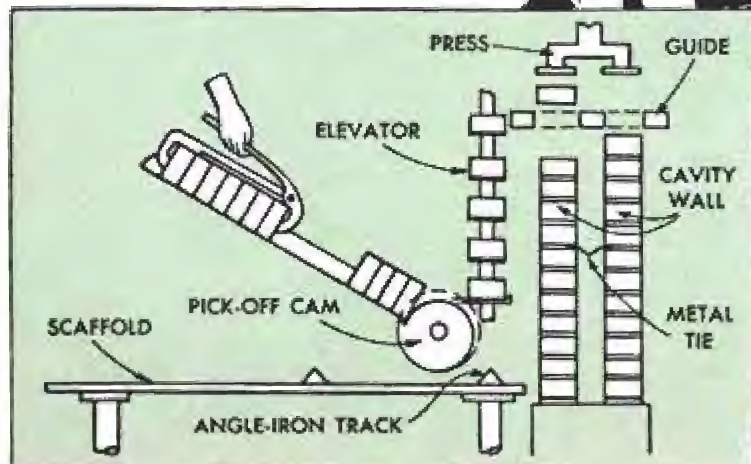
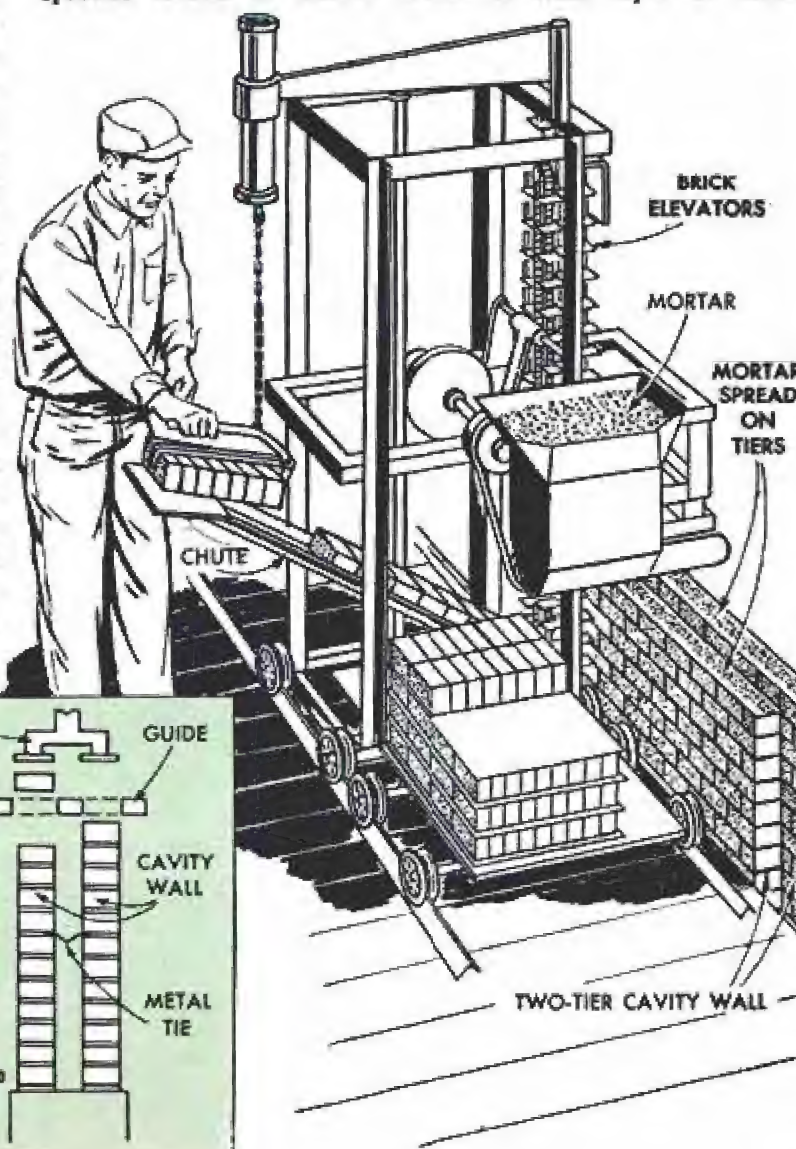
MEN WHO BUILT the LSM 445 during World War II certainly never dreamed that it would one day be an aircraft carrier. Yet today the former medium landing ship has an important role as the U. S. Navy's smallest carrier. As the USS *Catapult*, it launches drone aircraft for fleet gunnery training. Duplicating the maneuvers of real aircraft, the little planes fly through the air at 200 miles per hour, while gunners on cruisers, destroyers and carriers try to blast them out of the sky. Each drone is equipped with a parachute and, if unhit, drops into the sea when its fuel is exhausted. The *Catapult* tries to recover the \$3000 drone before it sinks, then hauls it aboard and prepares it for another flight. The drones are powered by gasoline engine and have a 12-foot wingspan. They're 10 feet long. Launching is accomplished by compressed air and is done from a sled that is shot at high speed along a set of rails on a portable catapult. Once in the air, the tiny planes are maneuvered entirely by radio remote control. A sailor aboard the *Catapult* transmits maneuvers which aircraft would attempt in a real attack to the drone by moving a small stick on a control box.

Robot Bricklayer Builds Cavity Wall

RUMBLING along on a pair of angle-iron rails, a clanking new robot spreads mortar and slides bricks into place at the phenomenal rate of 6000 a day. Not only that, but the "mechanical bricklayer" builds a 10-inch cavity wall. Father of the bricklaying machine is D. Douglas Demarest, well-known inventor who helped put the Army's World War I automatic guns in business. "Lots of people have tried to devise a good mechanical bricklayer," he explains, "but the process of laying up a solid brick wall was too complicated. Oddly enough, no one seems to have thought about the possibility of a machine to make a cavity wall." A cavity wall consists of two separate tiers of brickwork with a space between and held together by metal ties. This kind of wall stops heat, cold and rain. Here's how the robot works: Bricks are fed into a chute; at the bottom, lifting cams raise one brick at a time to an elevator that lifts a constant stream of bricks to the height of the course under construction. Here, each brick is pushed along a guide and positioned alternately on each tier of the wall. Each brick is then pressed into a bed of mortar already laid down by the machine like a ribbon of toothpaste. As the brick is shoved endwise by the robot, mortar is scooped on the end to form a vertical joint against the preceding brick. The machine will lay wall three feet high before scaffolding must be raised.



Bricklaying machine, shown in "dry run" demonstration, takes bricks from chute, raises them to course, pushes them in place. Diagrams illustrate how robot bricklayer could build cavity walls at a rate of 6000 bricks a day. Mortar trough automatically spreads ribbon of mortar ahead of next layer of bricks



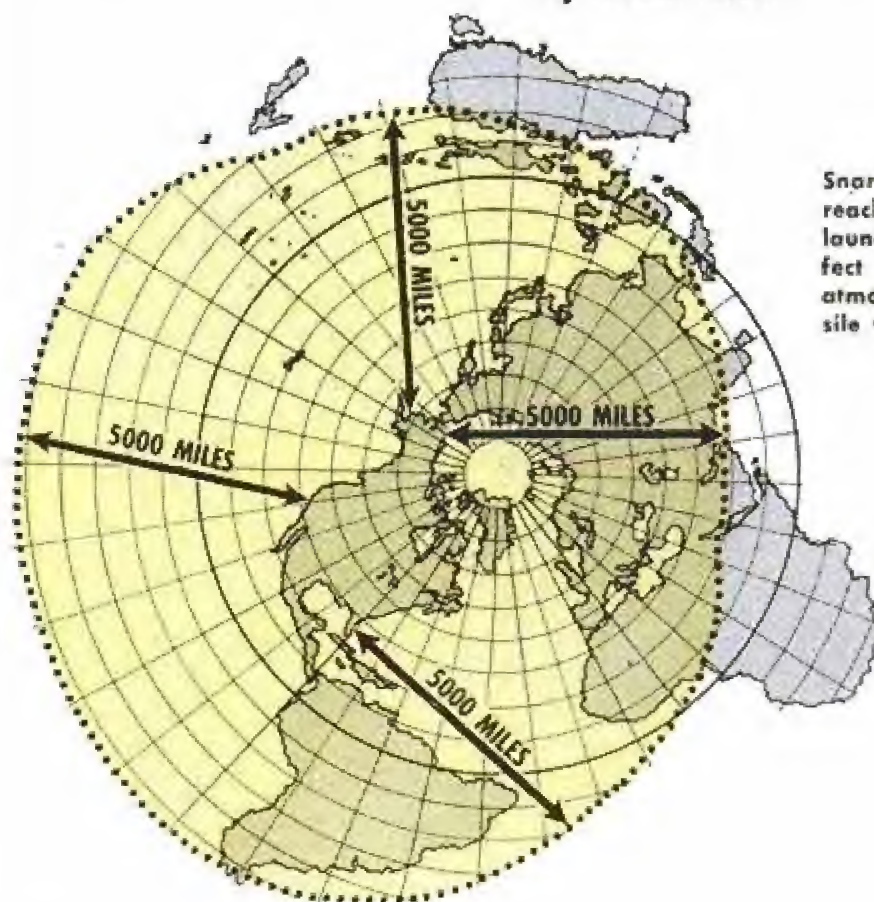


Northrop Aircraft photo

Graduation of the first class of missile airmen marks entry of the Air Force into long-range missile field

Out of School and Into Action: **Our First Guided Missileaires**

By Glenn Infield



Snark, with a range of 5000 miles, can reach a huge area of the world from launching points on this continent. In effect a pilotless bomber flying through the atmosphere, it is considered an interim missile which will be replaced by true ICBMs



Three members of SAC's first intercontinental-missile squadron study maintenance check-out of the Snark

IN A FIELD near Worcester, Mass., three men surrounded a clothesline strung on pulleys.

"Ready?" asked Dr. Robert H. Goddard, the tall man standing beside a homemade rocket.

Both the others nodded. One started running as hard as he could with a rope. It was his job to pull a hand-lighted igniter into the firing chamber. The other man jerked the next rope. It opened a fuel valve. There was a rolling snarl, and the rocket was airborne.

It was a feeble thing, this rocket. It rose only a mile or so. But it was the first liquid-fueled rocket ever to fly. That was in 1926. On December 17, 1957, a group of top Air Force brass, civilian scientists and engineers sat on a speakers' platform at Hawthorne, Calif. Behind them were two buildings. One, measuring 60 by 90 feet, is used to test and adjust engines in the Snark, the world's first operational intercontinental guided missile. The second, 100 feet square and 40 feet high, is known as a "preflight test facility." This building is used for simulated launchings under field conditions.

Quite a change from Dr. Goddard's rope-pulling take-off. But even 10 years ago guided missiles were but a whisper in the corridors of the Pentagon. Three years ago the whisper became a noticeable murmur. Now, standing in front of the speakers' platform in California was the first class of the Strategic Air Command's "missile airmen," experts designated to man our first intercontinental guided-missile squadron.

It was the initial step in the integration of missiles and missile technicians into the SAC—and perhaps the eventual replacement of piloted bombers.

Hand-Picked Men

These men, graduates of the Northrop Training School, are qualified for a rating in the Air Force's new career field, "guided missile systems." Sixty of these men were hand picked from the SAC and immediately after graduation were assigned for Snark operation to the 556th Strategic Missile Squadron at Patrick Air Force Base in Florida. This new guided-missile squadron will be manned eventually by some 500 officers and airmen.

The command of the 556th is in the hands of 37-year-old Lt. Col. Richard W. Beck, a veteran of 16 years' service in the Air Force and a rated command pilot. During World War II he served as a bomber pilot in the European Theater of Operations, flying 33 combat missions. Like many of the Air Force officers with silver pilot wings on their shirts, Beck foresees the day when pilotless missiles will take over the job of bombing while the flight crew stays on the ground. He has been working with guided missiles for a long time but admits he is no technical expert on the complicated mechanism inside the Snark. "Let the engineers develop them," he says. "It's my job to figure the best way to put them into operation."

Most of the missile airmen in this first intercontinental squadron have worked with the latest jet planes in the Air Force



Snark's great range was still further increased by the addition of auxiliary fuel tanks under the wings

for several years. They have little trouble in converting their skills from planes to guided missiles.

Now there are seven job specialities under the guidance-and-control-system superintendent. They are guidance-systems technician, and mechanic, instrumentation technician, and mechanic; control-systems technician, and mechanic; and a guidance-and-control systems helper. The work of the missile airmen includes assembly, installation, maintenance, check-out and repair of guided missiles, rockets and instrumentation equipment. They study all aspects of the equipment that

With rocket boosters flaming, Snark is an awesome spectacle as it leaves launcher and heads for target



guides a missile in flight, and the instruments that measure pressure, temperature, strain and velocity. Such equipment includes multiplexing devices, telemetering transmitters and receivers, and remote indicating and recording devices.

First Flight of the Snark

Last fall, the final station at Ascension Island on the down-range proving ground at Patrick Air Force Base was completed, and the entire 5000-mile test lane was opened. The Snark was the first missile to use the full length of the range. It was launched on Oct. 31, 1957, from its mobile launcher. On this first flight it was deliberately headed off course to prove the capability of the guidance system, then was accurately brought back to its planned flight line. Continuing its flight, it arched over the picket ships and delivered its warhead as planned near Ascension Island, marking a new milestone in global Air Force capability.

The 556th will use this range for its training. No missiles will be launched from permanent operational sites except in case of war. The missile airmen will be busy. Launching a Snark requires many precise and coordinated operations. It blasts off from a 29-foot launcher rail. Before this, however, many checks and double checks during the countdown are necessary.

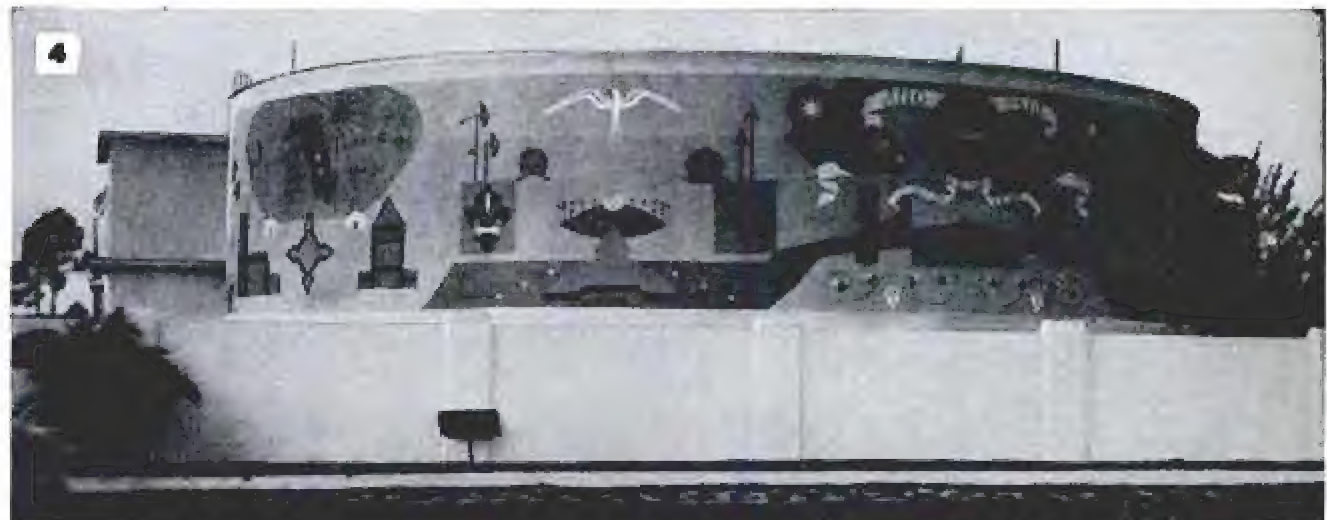
Key components in the launch itself are two powerful, high-thrust booster rockets that push the Snark into the air in one gigantic blast. Each booster is a long metal

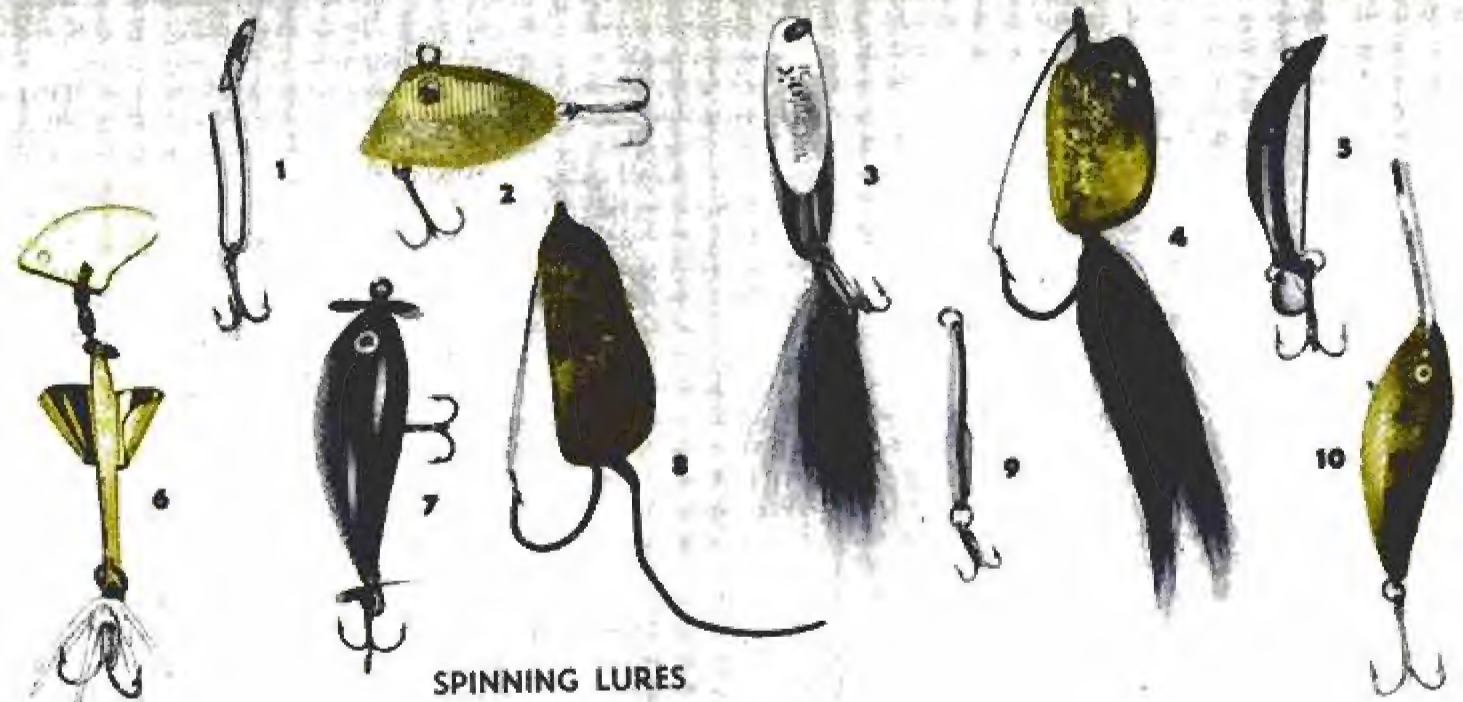
(Continued to page 208)



What's Behind the Doors?

WHAT'S TRUE of a book's cover is also true of a building's face nowadays. No longer can you confidently pin down a building's purpose just by looking at it. Consider the pictures on this page, for example. If you and your little boy were out walking and the eager-eyed young man asked you what these buildings were, what would you answer? Colonial-type residence? Hospital? Office building? Theater? Well, look again. Then turn to page 216 for the correct answers. You're in for a surprise, for in these days of suburban expansion, many neighbor-conscious utilities and services are disguising the true purposes of their buildings with facades that render them more compatible with their residential surroundings.

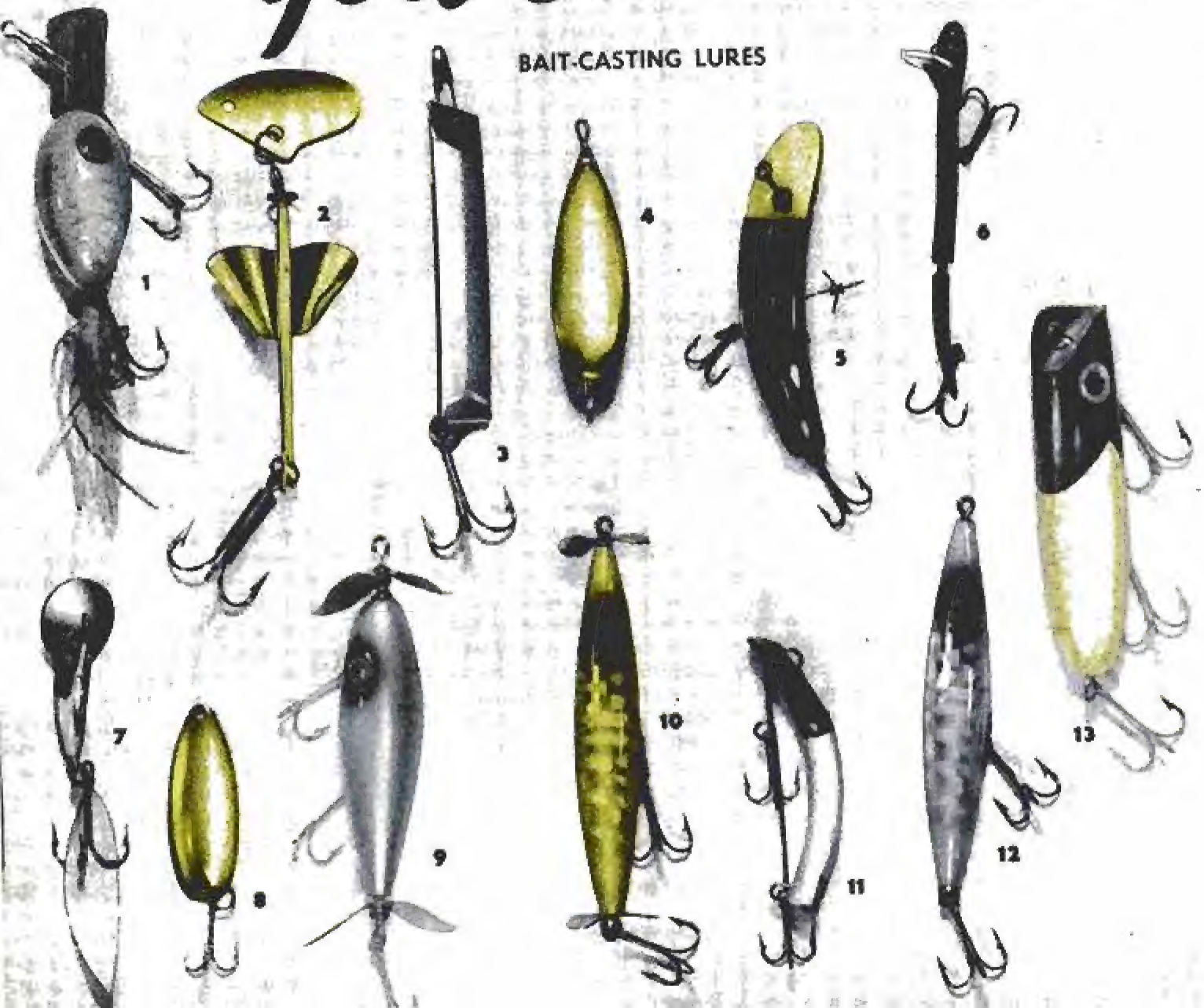




SPINNING LURES

You Can Catch

BAIT-CASTING LURES



Here are some of the most popular lures for hooking bass. **SPINNING LURES:** 1. South Bend Super-Duper; 2. Weber Mystic; 3. Weber Mr. Champ; 4. Weber Spinning Frog; 5. Horrocks-Ibbotson Rangley Minnow; 6. Hagen Spinner; 7. Weber Little Sam; 8. Weber Spinning Mouse; 9. Johnson's Lujon; 10. South Bend Rock Hopper. **BAIT-CASTING LURES:** 1. Fred Arbogast Arbo-Gaster; 2. Hagen Spinner; 3. South Bend Super-Duper; 4. Johnson Silver Minnow; 5. Horrocks-Ibbotson Elco Freakfish; 6. Garcia Depose; 7. Horrocks-Ibbotson Finback; 8. Johnson Sprite; 9. South Bend Nip-I-Diddee; 10. Heddon Dying Flutter; 11. Horrocks-Ibbotson Get-Fish; 12. Heddon Dying Quiver; 13. South Bend Bass-Oreno



More Bass

By George Laycock

OF THE 20,000,000 people who will go fishing this year a large percentage will be trying their best to catch large-mouth bass, the most popular game fish in the country. No wonder. Bass are found today in practically every part of the country. New reservoirs and ponds have made new living quarters for bass and brought bass fishing closer to home for millions of anglers.

Here is a fish with a built-in challenge. He is a fighter on the end of the line. He is pugnacious enough to strike a lure out of sheer meanness. And he is unpredictable enough to test the skill of any fisherman. Largemouth bass are plentiful enough to insure some success to almost any angler who goes after them seriously.

Seasoned anglers who take bass regularly have learned some tricks and techniques which add fish to their stringers. The following pointers can help you take your share of bass this season.

Tailor your fishing to the time of year and time of day. In spring and fall you'll find bass in shallower water than during midsummer. In early spring, cast around the shores of lakes and ponds; that's where the big ones will be. They nest around the edges. A growing number of states now permit year-round bass fishing. Biologists have learned that fishing during the spawning season seldom harms the bass population. In early spring bass will take a wide variety of plugs.

In midsummer, as days grow longer and the water warmer, bass move out into deeper water. Experiment by fishing at different depths until you locate the bass.

Daylight and Dusk Fishing

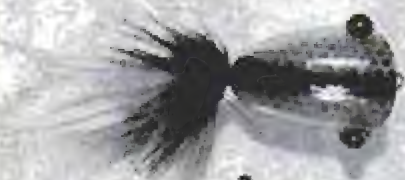
The time of day that you go fishing also plays a role in where you'll find the fish. Seasoned anglers like to go bass fishing about daybreak and again in the evening around dusk. Bass seem to feed more at these times, and the aim, of course, is to catch them when they're hungry. You're likely to find them in shallow water feeding on minnows at these times.

Fish the edges for bass. Watch habitual





1



2



3



4

FLY-CASTING LURES



5



6



7



8



9



10



bass fishermen and you'll soon see that they're not haphazard casters satisfied to let their lures fall anywhere as long as they're in the water. Instead they fish the edges.

The big bass lurk around underwater obstructions and dash out occasionally to feed on hapless minnows that may come within their view. Try casting along the edges of weed beds, around rocks, logs or brushpiles and the shore itself. Bass often lie along the edges of underwater shelves or fallofs. And once you've taken a good-size bass from a bassy-looking spot, bear the location in mind. Bass have their own territories. You may be able to go back later and find that another bass has taken up residence in the same spot. The more you fish for bass the more you realize that fishing the edges pays off.

Fish the farm ponds. Within the last quarter century farmers all over the country have been building ponds. Estimates place the number of farm ponds at more than a million. They're small, usually less than an acre in size, but they are yielding big bass. They were built largely for watering livestock, but the farmer with a new pond usually wants it stocked with

FLY-CASTING LURES: 1. Weber Super-Duper; 2. Weber Scaly Popperakle; 3. Weber Scaly Creepy Popperakle; 4. Weber Slim-Bug Popper; 5. Weber Frog; 6. Lachmann Pickerel Frog; 7. Lachmann Silver Shiner; 8. Lachmann Palmer King Streamer; 9. Lachmann Tri-Color Bass Fly; 10. Weber Mouse



To jig for bass, use long pole with gob of worms. Work bait slowly up and down, just beneath the surface

fish. Most are stocked with bass and bluegills. (Always get permission from the owner before you fish his pond.) Such ponds are excellent waters for fishing slowly with fly rods and cork-bodied bass bugs late in the day.

Fishing the Jumps

Bass fishermen on the big new lakes in the Midsouth have worked out a couple of fresh ideas that are highly effective in taking bass. One of these is called "fishing the jumps." Herrington Lake fishermen in Kentucky started fishing the jumps 20

years ago and they've been at it ever since. The idea has spread to other lakes because it is a proven bass-getter.

These pioneering fishermen noticed that the bass were feeding near the surface on schools of shad early in the morning and late in the evening. They began casting plugs right into the spots where the bass were feeding. They knew the bass were there and they knew they were hungry. The idea worked so well that it soon became a favorite style of bass fishing.

Fishing the jumps works best through
(Continued to page 204)

Fish symbols mark likely spots for bass—along shore, in weed beds and lilies, around logs, brush and rocks





Alaskan Flier Builds Plane for Rugged Bush-Country Service

Jerry Lawhorn of Anchorage, Alaska, couldn't afford to buy the type of plane desirable for hops to remote hunting and fishing spots, so he designed and built one. The project took nearly three years of his spare time, but when he was done he had a plane that could take off and land in a 200-foot patch of extremely rough or soft ground, the type of terrain common in the

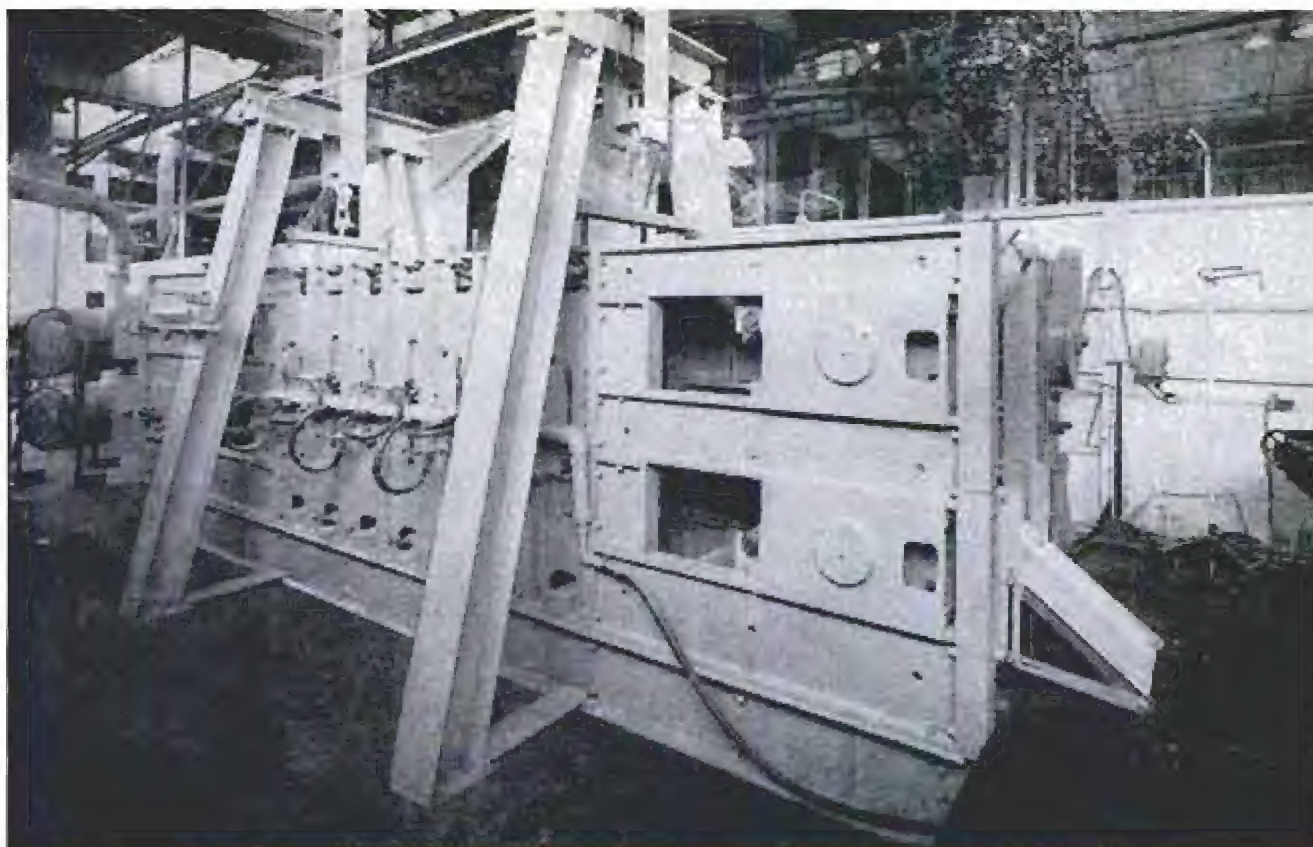
bush country of the far north. Powered by a 190-horsepower engine, Lawhorn's "Kee Bird" cruises at 110 miles per hour and has a top speed of more than 125 miles per hour. Its doors are hinged at the top and can be locked in "open" position during flight, handy for aerial photography, shooting wolves and dropping supplies. The plane seats three.



Slide Holder Has Snap-on Top

Slides can be mounted quickly and easily in plastic-metal holders. By squeezing the sides of the holder, the top snaps off. The transparency is inserted between two sheets of extra-thin glass, and the top is re-attached to a pair of snap hooks built within the sides. The holder can be used in any slide projector or viewer and is rust-proof, and heat-resistant. A white paper strip on the holder provides ample space for titling the slide.





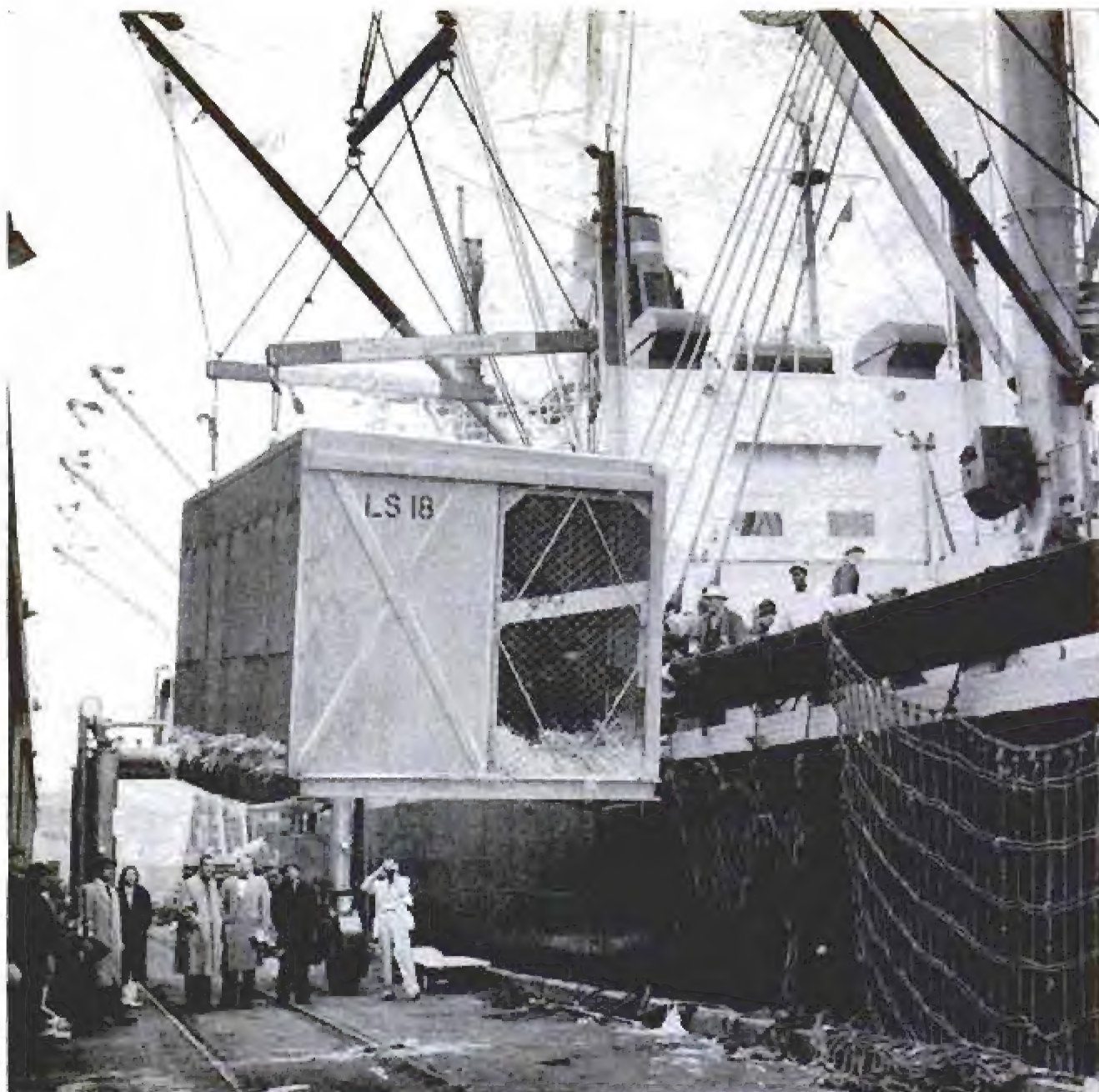
Here's One for the Books— A Real Lumber Stretcher!

Once there were three mythical tools—the left-handed monkey wrench, the sky hook and the lumber stretcher. Now there are only two, for the lumber stretcher has been invented. The stretcher is a huge machine developed by Frank O. Higgins of New Orleans, La. The lumber stretcher is just that. It creates a piece of lumber or veneer which is larger when dried and finished than it was in its wet stage. It does this by creating "expansion joints" in the wood. As a result, the lumber will not expand farther even though submerged in water for long periods, and will not shrink or contract. The process has no appreciable effect on the thickness or grain pattern.



Three "Pontoons" Form Single Hull In New Boat Design

In a new boat design, three "pontoons" are shaped into a single hull. The resulting hull, at first glance, appears to be a catamaran with a third pontoon in the middle. Actually, unlike a catamaran, the three sections sweep into a single unit not far from the bow. The boat, according to the designer, can be steered straight as a string even in heavy seas on stern or quarter. An advantage of the design is that spray which normally whips into the helmsman's face is confined under the overhang on the bow. Because the hull does not come to a point at the bow, there is more space below.



A van of bulls is hoisted aboard ship, headed for the Philippines. The vans have a capacity of six bulls

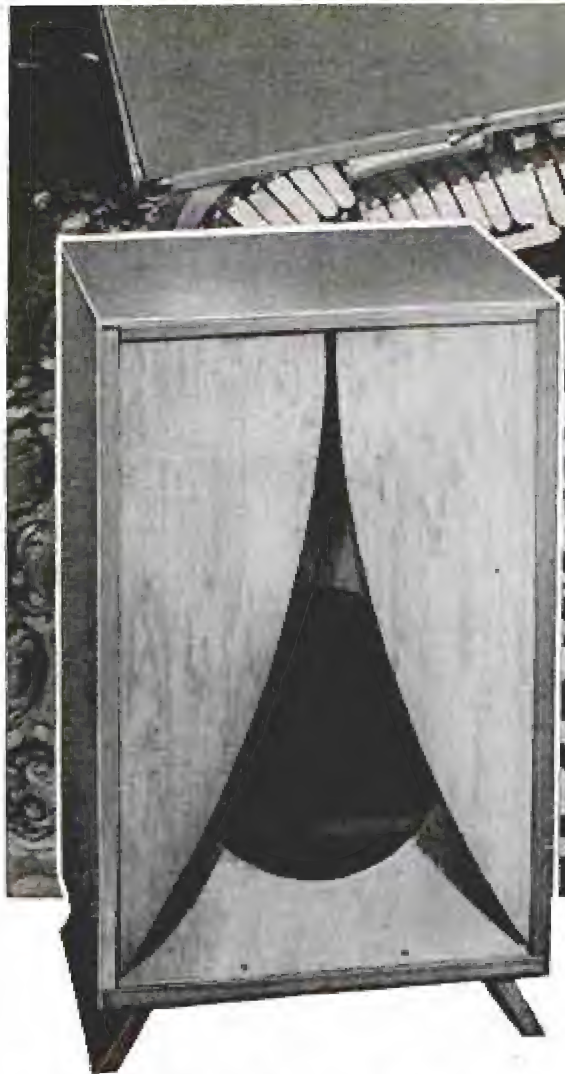
During the voyage, the bulls feed at troughs attached beneath the vans' upswinging side panels



Crate for Cattle

SHIPPING CATTLE overseas in boxlike vans is cutting loading and unloading time from days to hours. Called "portable corrals," the vans are patterned after methods used to transfer circus animals into the arena by connecting cages. They are placed end to end on the dock and sliding doors between them are opened. The animals are driven from trucks down a chute and through the line of vans. When the last van is loaded, the doors between it and the van ahead are locked. This is repeated down the line. After the vans are hoisted aboard ship, side panels are opened and troughs for feed and water are attached. At the destination, vans can be unloaded on docks or discharged directly on flatbed trucks or flatcars for delivery.

Radio Television Electronics



By John E. Karlson

THE KARLSON ACOUSTIC TRANSDUCER FOR HI-FI AND MUSIC

IN ORDER to satisfy his basic desire for music, man has devised literally thousands of different instruments for its creation and reproduction. These efforts now involve a huge industry in which hi-fi is spurring an ever-increasing research into the means for producing better sound. A key item in this research is the loudspeaker system which is expected to reproduce perfectly the sounds of all other musical instruments. This means that the loudspeaker systems must, in themselves, be musical instruments of the highest order.

The principal problem in meeting these aims has been the conversion of the mechanical vibrations of the loudspeaker into sound waves which closely represent the electrical signal driving the speaker. The typical cone-type speaker mounted in a simple cabinet, as used in ordinary radios, TV sets and phonographs is completely inadequate for such use. The same speaker, however, mounted in a scientifically designed acoustic structure, might very well approach these requirements to an amazing degree.

Even with the most elementary types of

speaker systems, some form of baffle must be used. The baffle prevents the sound waves emanating from the back of the speaker cone from interfering with and canceling the waves from the front. This is frequently done by mounting the speaker on a large flat surface so that there is virtually no acoustic path between the front and rear of the speaker. A close acoustic equivalent to this is the so-called "infinite baffle" which isolates the front wave from the back wave simply by enclosing the rear of the speaker in an airtight chamber. The resultant sound, therefore, is purely dependent upon the potentialities of the speaker as a "direct" radiator.

At low-audio frequencies, this imposes severe limitations on the speaker's ability to produce any sizable output. This is due to the fact that when a speaker cone is moving back and forth slowly, it is incapable of developing sufficient air pressure to create a low-frequency sound wave. This applies to all sounds below a certain critical frequency, dependent upon the diameter of the cone used. It is quite customary,

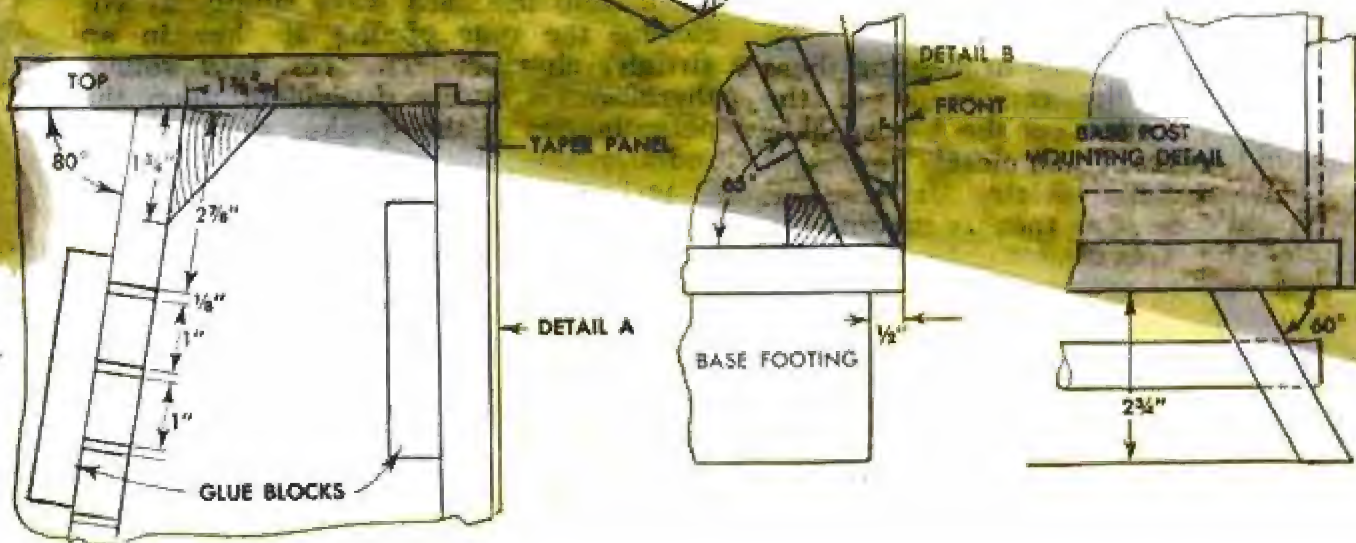


Fig. 1. Construction details of the Karlson enclosure for 12-in. loudspeakers. This design is covered by patent No. 2,816,619 and may not be reproduced for commercial purposes

therefore, to employ the largest cone possible for the reproduction of these low frequencies.

Such cones, however, are not ordinarily effective at the high frequencies. In addition, any high-frequency tones radiated from a large cone are sharply "beamed" so that they are audible only in certain areas of the room. This, of course, is highly undesirable and, as a consequence, a separate small speaker is generally used, in addition to the large one, to overcome this detriment. Frequently, a third speaker is added for the midrange, thus providing a bridge between the "woofer" and "tweeter" as the above mentioned separate speakers are called. To avoid the distortion which would result from applying the electrical signal to all speakers simultaneously, it is also necessary to provide a "crossover network" which divides the signal from the amplifier into its various frequency components and channels these into the appropriate speakers.

To the uninitiated, the above process may seem complicated and, indeed, it must be when we consider the nature of the desired acoustic output. Variations in air pressure accompanying natural sounds are extremely complex and, in reproducing these faithfully, the speaker system must be capable of following the extreme pressure peaks and valleys and duplicating the exact timing relationships between each wave-front. When such a signal is split up and applied to separate speakers, the system's ability to provide clear definition and exact timing is often severely limited. With the use of good coaxial and triaxial speakers, in which the woofer and tweeter, or woofer, midrange and tweeter, are all in one integral unit, the resultant sound will be more thoroughly balanced, but even these are subject to limitations when used

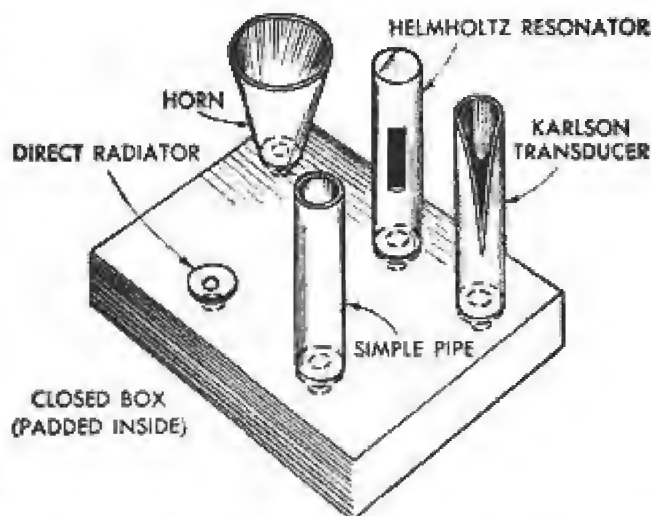


Fig. 2. Various types of acoustic transducers which form the basis for most speaker-enclosure designs

as direct radiators. Speaker cones, constructed of flexible materials, such as paper, tend to produce spurious responses when excited by a strong driving signal. These are especially predominant in the midfrequency range, where the ear is most sensitive, and create a good deal of distortion so typical of the ordinary radio. Several attempts have been made to overcome this deficiency by designing the cones so that they are less prone to these spurious responses by using soft, absorbent materials fabricated into the cones. Such efforts often result in loss of sensitivity to the more subtle passages of music and sluggishness on heavy dynamic bursts.

Acoustic Transducers

As a result of the limitations of the simple direct radiator in an infinite baffle, the art has explored the possibilities of using certain acoustic structures for the purpose of improving the efficiency and sensitivity of cone-type speakers. Such structures, known as acoustic transducers aid in the

BUILDING THE KARLSON '12'

Proper performance of the enclosure depends largely upon rigid, airtight construction. All pieces are cut from $\frac{3}{4}$ -in. plywood and must be carefully machined for a close fit. Joints must be securely glued with a good grade of wood glue, such as Elmer's Glue All—Borden's. Apply enough glue to all surfaces to fill in any crevices in the joints and press the pieces together firmly in correct alignment. Nails may be used to hold the various pieces together until the glue has set.

Note that the straight sides of the taper panels are rabbeted to fit into corresponding grooves in the enclosure top and sides. These grooves therefore must be carefully aligned on the assembly.

The only unglued piece in the assembly is the enclosure back which is fastened to the back-panel cleats with wood screws for easy removal. Use at least three screws on each side and two at top and bottom to prevent vibra-

tions and to seal possible air leaks through the back cover. The cleats are placed to permit a uniform $\frac{3}{4}$ -in. depth for installation of the back panel.

The inside surfaces of the front chamber, including slant board, speaker board, sides and taper panels, should be covered with three successive brush coats of a very heavy lacquer. This provides a hard finish which prevents absorption of high-frequency sound waves. Grille cloth should be of open weave and should not extend more than 2 in. beyond the tapered opening when fastened to the inside of the taper panels. If mounted on the outside, it may cover the entire front of the cabinet. Cabinet trim may be used to cover all exposed edges.

All dimensions in Fig. 1 allow for $\frac{1}{4}$ -in. rabbets and $\frac{3}{16}$ -in. dado depths.

This enclosure will provide excellent performance with any good 12-in. extended-range, coaxial or triaxial loudspeaker.

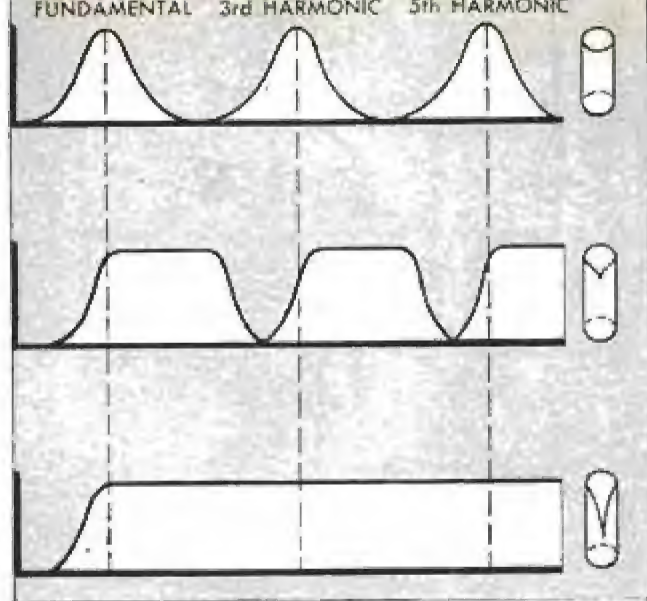


Fig. 3. Low-frequency air-pressure response of a simple pipe and pipes modified by tapered openings

conversion of mechanical energy into sound. Where a direct radiator can only produce extended low-frequency response by extreme movement of the cone, much more output can be obtained with little motion through the use of a properly designed acoustic transducer.

In the design of musical instruments and speaker enclosures, the only acoustic transducers previously in use were the pipe, the Helmholtz resonator and the horn. Now a new basic type, the Karlson acoustic transducer, has been added to this selection, as shown in Fig. 2.

The pipe, reminiscent of the organ pipe, has been used in various forms to load the back wave of a speaker, thus providing additional coupling to the surrounding air at the low frequencies. Such pipes, however, are resonant only to the fundamental frequency, as determined by its dimensions, and to odd harmonics of this fundamental. The bass-frequency loading effect of such a device, therefore, results in a series of humps in the response which might be impressive at certain frequencies but is certainly not representative of the original signal. Its radiation at higher frequencies is the same as in an infinite baffle and it is subject to similar limitations.

The pipe can be regarded as the father of all acoustic transducers. A horn is a pipe which is narrow at one end and wide at the other. The effect of this wide, open end is to reduce the intensity of the normal resonances expected in a pipe of the same length. A horn may be designed to provide a smooth response over a band of frequencies extending to about three octaves. Since the human ear is capable of hearing well over 10 octaves, obviously, at least three horns would be required to cover the complete range with this particular approach. Frequently, the horn is used to provide back loading of a direct radiator speaker.

This reduces the amount of cone excursion required to reproduce low frequencies, due to the virtual expansion of the cone size to that of the air in the mouth of the horn. This effect, known as "impedance matching," is due to the gradual transition from the high pressures developed against the cone at the throat of the horn, to the lower pressures existing at the mouth of the horn which more nearly approximate those of the surrounding air. A perfectly matched speaker would be capable of transferring all of its potential energy to the air while the efficiency of unloaded direct radiators may be as low as a fraction of one percent.

Several different types of horns have been designed, all of which require a relatively large mouth to be really effective. Although such horns can be made very efficient over a wide range of frequencies, they must be positively enormous in size to reproduce the very low frequencies. Many designs utilize the walls of a room to reduce the necessity for extreme sizes but even these are comparatively large and, consequently, quite expensive.

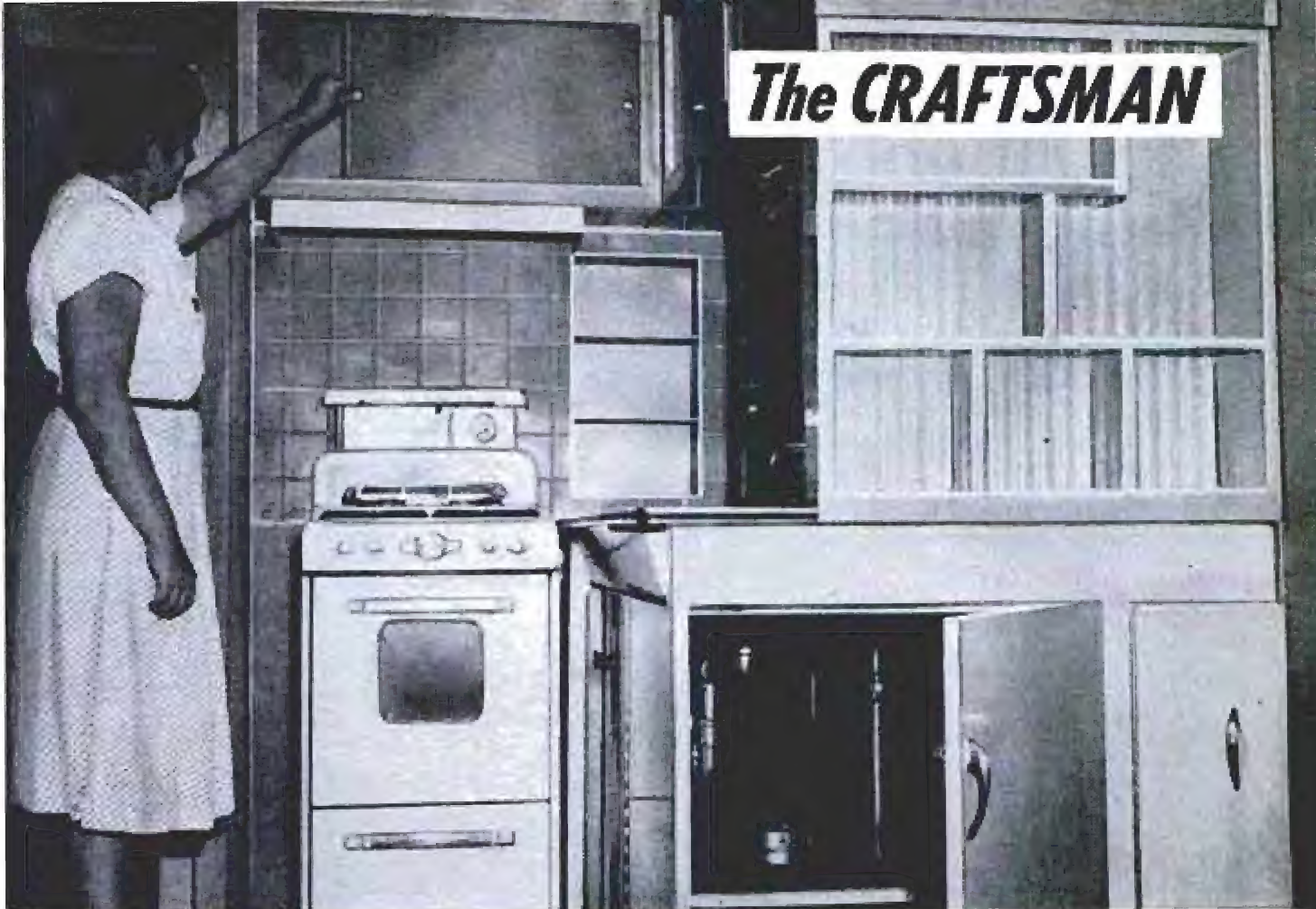
Probably the most popular acoustic transducer previously in use was the bass reflex enclosure which could be constructed from a simple box with a judiciously sized port, or opening, cut in one of its sides. This type of structure, known as a Helmholtz resonator, is resonant at a single frequency. The resonance peak can be broadened to about one octave by designing the enclosure to resonate at approximately the same frequency as the resonant frequency of the speaker with which it is to be used. This occurs through a phenomenon known as "critical coupling" and, as the name implies, it requires a careful match between speaker and enclosure in order to provide optimum results.

The necessity for such critical adjustment has led many hi-fi fans to believe that a speaker and enclosure must be exactly matched in order to operate properly. This, of course, is not true with all designs. The principal improvement in bass response with the Helmholtz resonator stems from the fact that the air in the port, resonating with the direct radiation from the speaker, virtually doubles the size of the speaker cone. Below the resonant frequency, however, very little output is realized, and in the mid and high-frequency regions the output is again subject to the limitations imposed by the speaker acting as a direct radiator.

The Karlson Acoustic Transducer

A few years ago, a radically new type of transducer was introduced to the high fidelity market. Though relatively small in

(Continued to page 214)



Doors of range cabinet and back of room-divider shelf are translucent plastic. Lower cabinet holds TV set

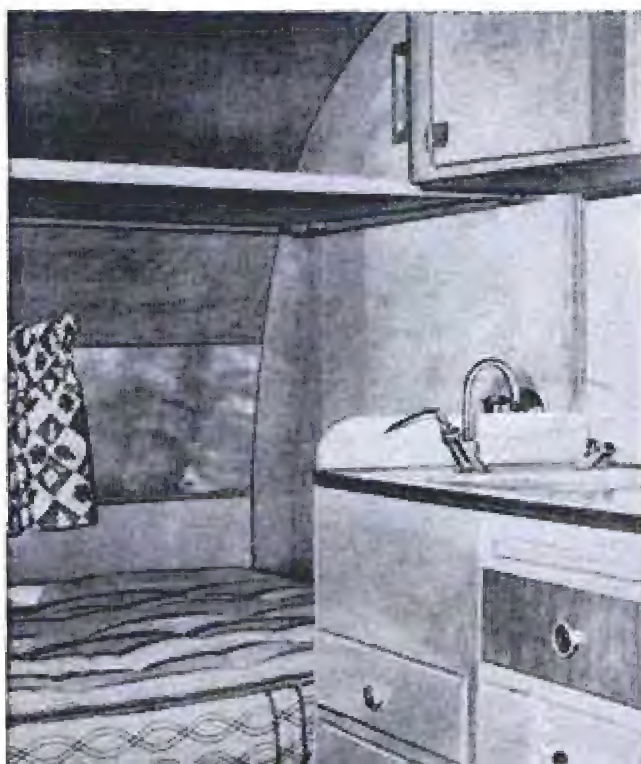
Utilizing All Trailer Space

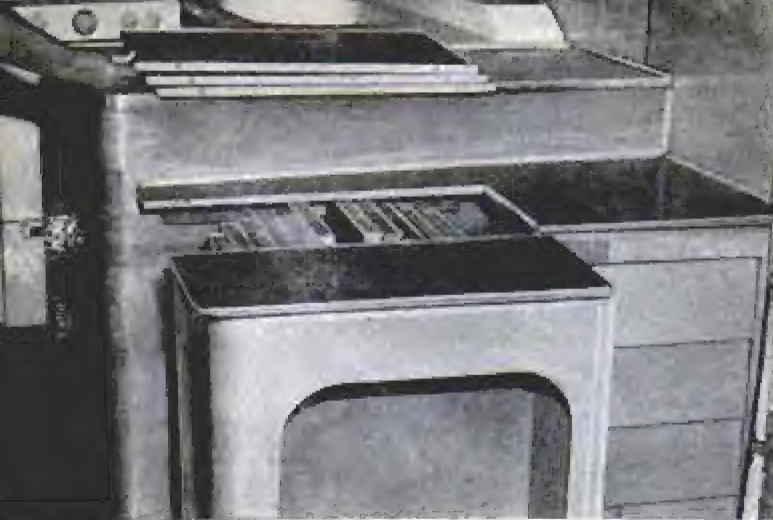
ADEQUATE STORAGE SPACE is a critical problem in a trailer. Shown here are some of the methods used by "trailerites" to get maximum storage in minimum space. Some items are purchased,

others are "custom built." Plastic and plywood construction keeps weight down. Cabinets are fastened to wall members, then to ceiling, not to plywood "skin" of trailer.—C. R. Hull, Santa Ana, Calif. ★ ★ ★

Canvas bunk over regular bed adds another sleeping space. This is a stock item and can be purchased

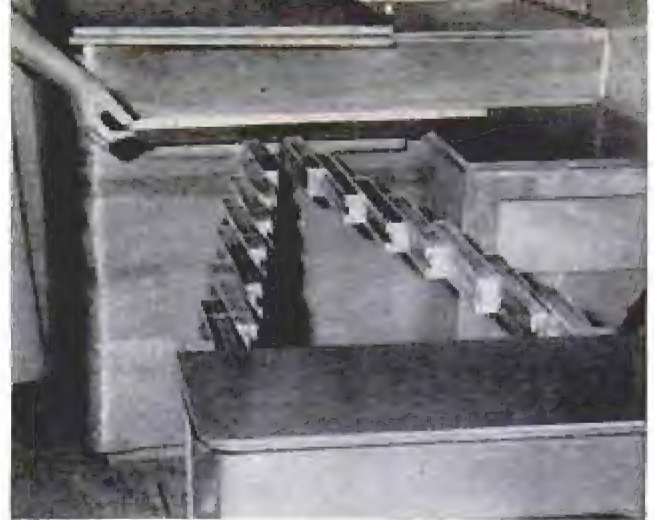
Handy utility rack on the inside of this wardrobe door is 4 in. deep, utilizes space otherwise wasted



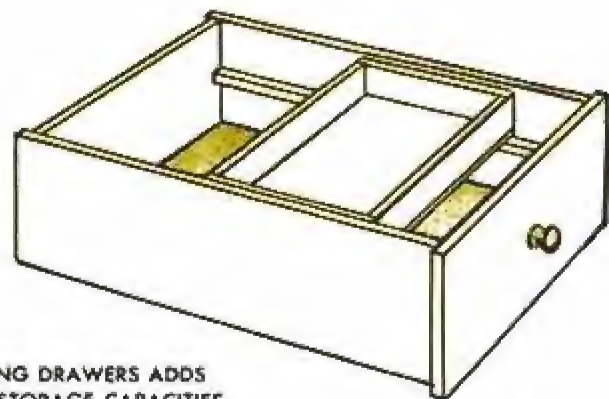
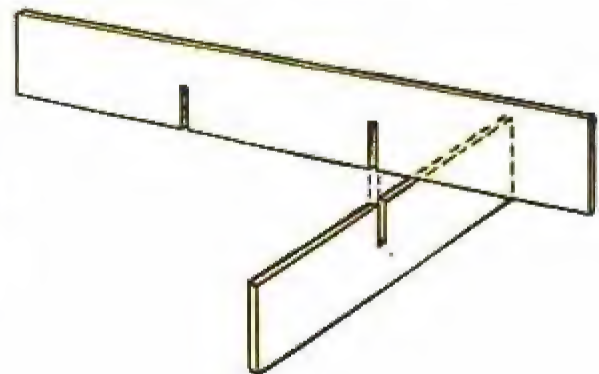
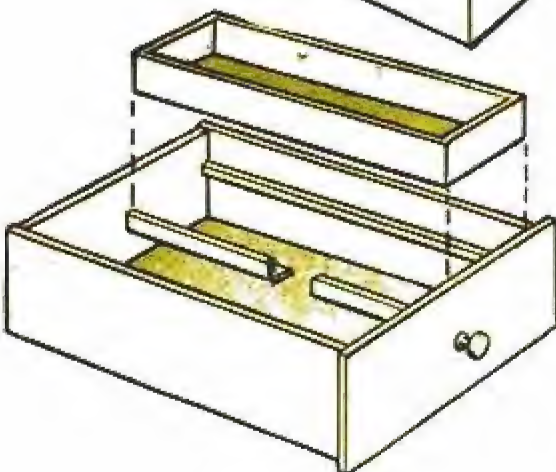
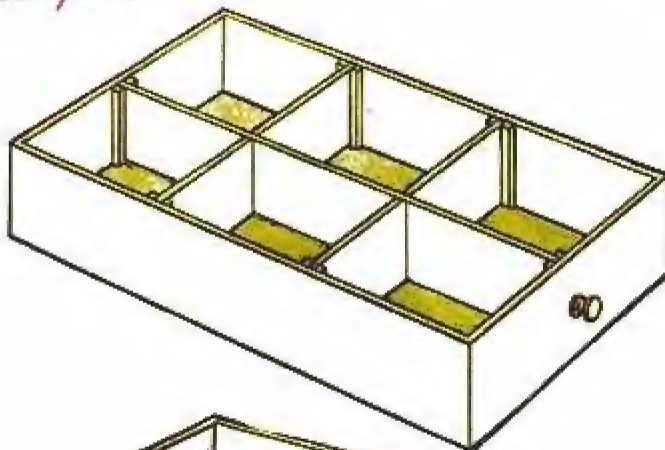


Above, writing desk has drawers at side, opens up to accept leaves, right, above, and become dining table seating five. Unit is a manufactured item

SILVERTOWN SLIDE CORP.
SILVERTOWN, WIS.

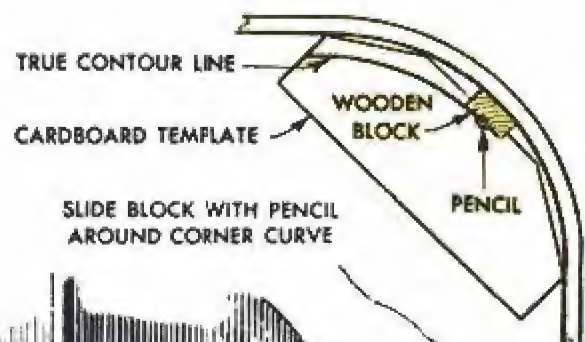


Sketches below, small drawers can be partitioned to increase their usability, larger ones are fitted with smaller drawers that lift out, or slide front to back

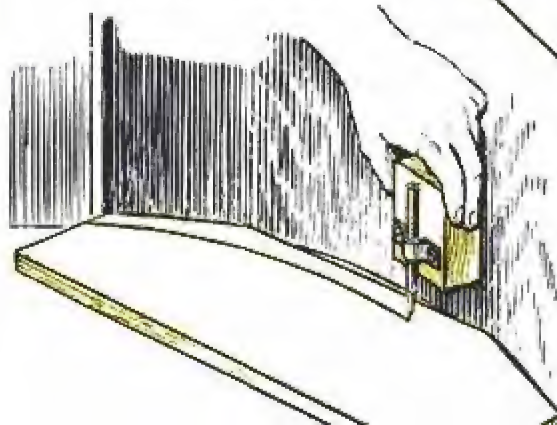


MODIFYING DRAWERS ADDS TO THEIR STORAGE CAPACITIES

Below, shelves can be fitted high in rounded corners of trailer. Shelves are cut by making template, sketch, upper right, or by marking shelf directly, as at right



SLIDE BLOCK WITH PENCIL AROUND CORNER CURVE





Half-width shelf in cabinet holds cups and saucers, does not interfere with storage of bowls and plates on lower shelf. Note extra shelf at range's right



Venetian blind used as room break is left open for passage of light and air, closed for privacy. When not needed, the blind is raised up out of the way



Clever knickknack shelf, that also could be used as a bookshelf, was installed by one owner to break up blank wall space, and put it to practical use

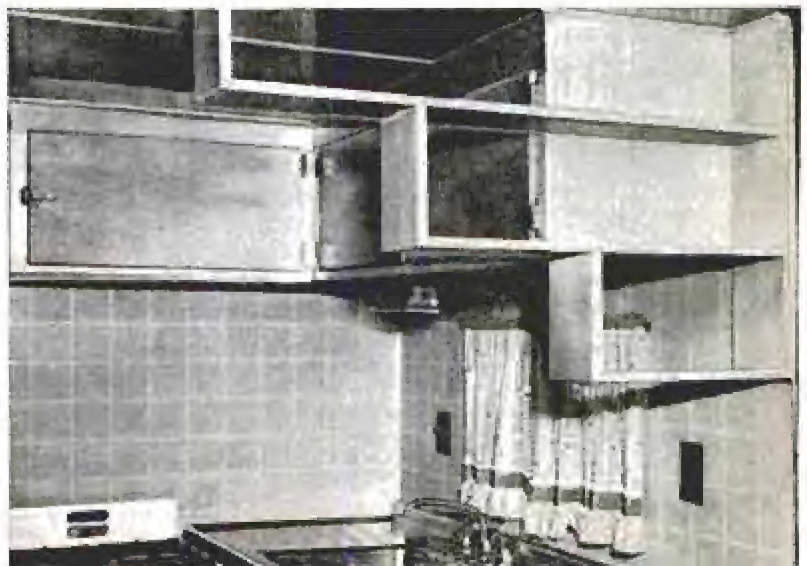


Door on side of trailer provides access to storage space under fixed bed or seat, so items for outdoor use can be reached without entering the trailer

Below, this floor cabinet pivots on full-length, piano-type hinge with "out" end supported on casters. Opened, it is snack bar; closed, a storage cabinet



Below, another room break does double duty. Shelves hold bric-a-brac or books, are arranged in steps to provide maximum storage, adequate headroom





Store Appliance Cord On Plywood Reel

Appliance and extension cords won't become tangled or kinked, when each one is stored on a reel cut from a piece of scrap plywood, as indicated in the detail at left. Also, the slack portion of a lamp cord may be kept on a reel to prevent tripping on it. A notch is provided at each end of the reel for securing the cord ends to prevent unwinding. A hole drilled in one end of the reel permits hanging it on a hook within convenient reach. The size of each reel will depend upon the diameter and length of the cord to be stored on it. When several reels of similar size are used for storing cords from several appliances, each may be painted a different color for easy identification.—Hugh F. Williamson, Metairie, La.

Slit Garden-Hose Lengths Make Excellent Toolholders



Holders for storing tools on a shop wall were made from short lengths of rubber garden hose by one home craftsman as shown in the illustration at left. To make such holders, simply cut the required number of hose lengths and fasten them to a length of wooden stock for mounting with mending plates as indicated in the detail. Discarded rubber tubing of small diameter will serve well also. Similar holders may be made for supporting a young plant having a weak stem. To do this, clamp a 1-in. length of slit hose to a wooden stake in the same way as when making toolholders or, simply nail the slit hose to the stake. Then push the stake in the ground next to the plant and carefully insert the stem in the holder. When proper growth is established, the support should be removed, being careful to spread the slit hose sufficiently to avoid damaging the stem of the plant which is inserted.

George H. Holden, Chesterfield, England.

Type-Case Separators Refastened



When separators in wooden type cases or small-parts drawers have become loosened to the extent that their contents intermix, flow two or three coats of plastic cement along the bottom edges of the separators to seal them in place. Ample drying time should be allowed between coats for best results. Refastening the separators in this manner not only closes all gaps between them and the bottom of the case but it also produces rounded corners along the bottom joints as shown in the detail. This permits easier grasping and removing of small type.—C. D. Tinder, Findlay, Ohio.

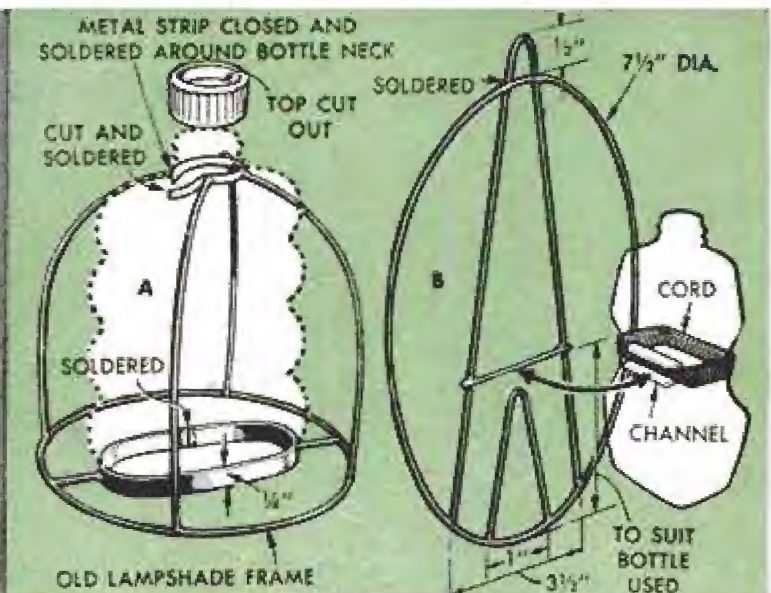


Flower Vases From Fancy Bottles

WHAT CAN YOU DO with those lovely shaped bottles? Make them into vases by cementing several together so they stand firmly, fit one with a wire rack, or cement on sequins or "glitter." A frame for the bottle at the center of the top photo is cut and soldered from a lamp-shade frame and coat-hanger wire as in detail A below. Framed bottle in lower, left-hand photo is made the same way, as in detail B. Trimmed cap becomes threaded sleeve to hide threads.



Sequins, rhinestones, shells and pebbles, held with household cement, will add sparkle to a plain bottle.



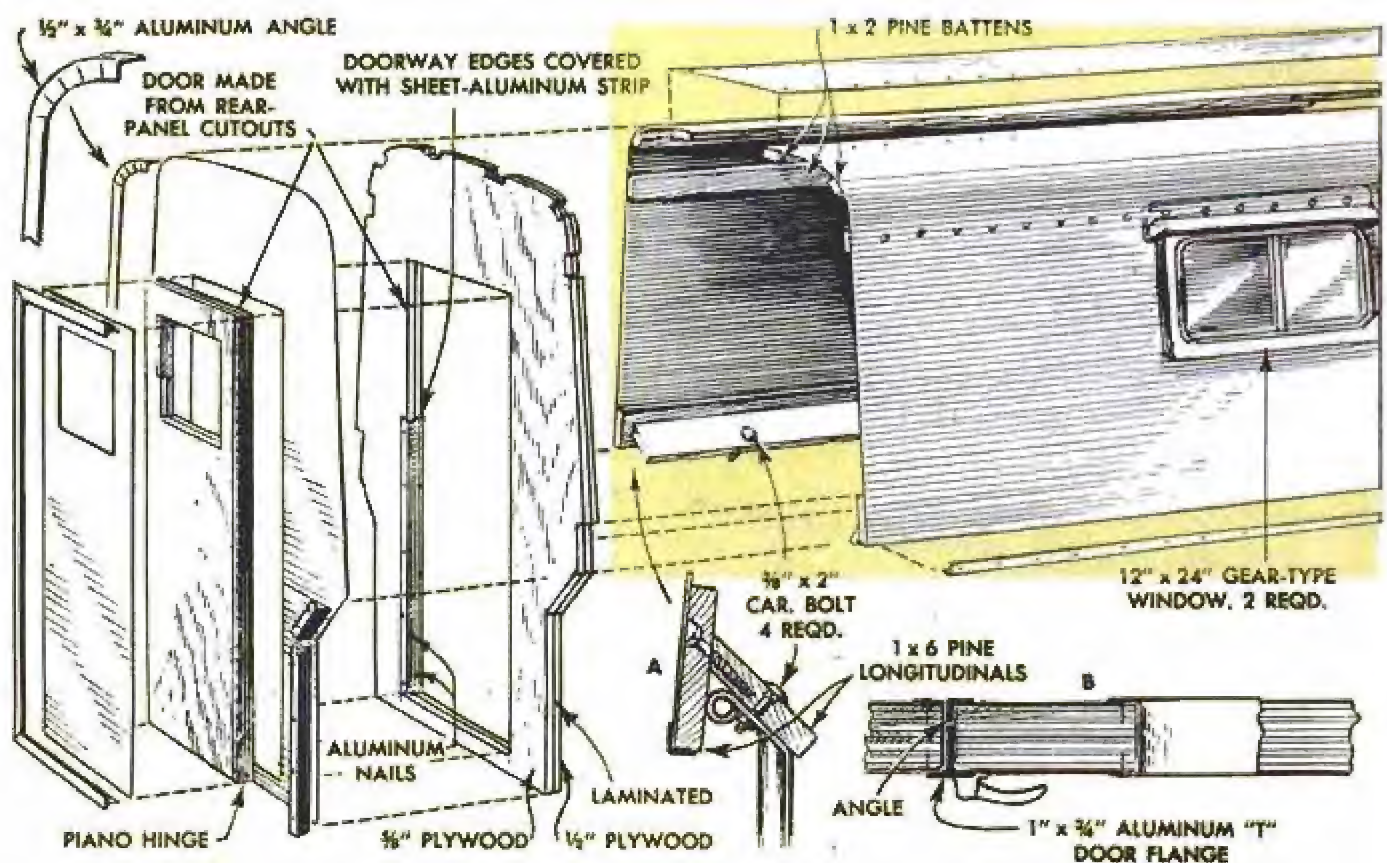


Sportsman's Cab for Pickup Truck

By Hans E. Anderson

HUNTING and fishing trips are a real pleasure when ample carrying space for all necessary gear and comfortable sleeping accommodations are provided in an all-weather cab mounted on the box of a pickup truck, such as the one illustrated. Also, the cab is ideal for small families who like to take travel vacations but must do

so on limited budgets. When built to fit on an 8-ft.-long truck box, the cab will sleep four adults on inflatable mattresses, two on the truck bed and two on a detachable plywood platform mounted on the cab sides at the desired height (not shown). This arrangement leaves ample space at the front end of the truck box for food and





Gear-type combination window and screen provides adequate ventilation, yet keeps out insects and rain

equipment lockers. Other sleeping arrangements can be devised.

Gear-type windows fitted with screens on the sides and rear door provide adequate ventilation and prevent insects from entering. Since lightweight materials are used wherever possible, the unit can easily be removed and replaced on the truck by two men. Four bolts fasten it to the truck box as shown in detail A of the drawing. To accommodate the model shown in the



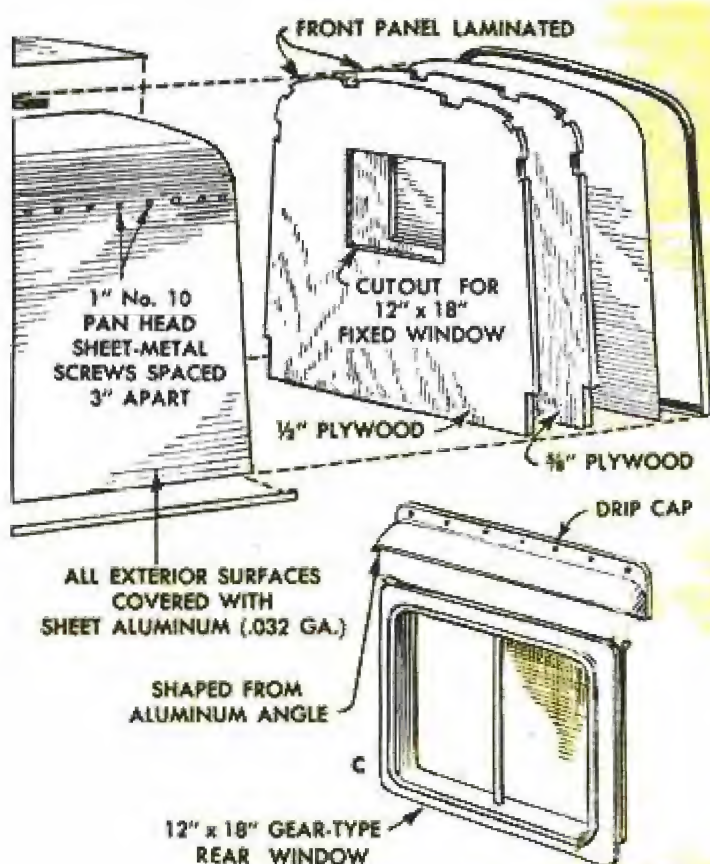
All-aluminum exterior of shelter cab reduces maintenance problems and helps to keep interior cool

photos, the tailgate was removed. If you wish to leave the gate intact, simply make the cab slightly shorter than the box.

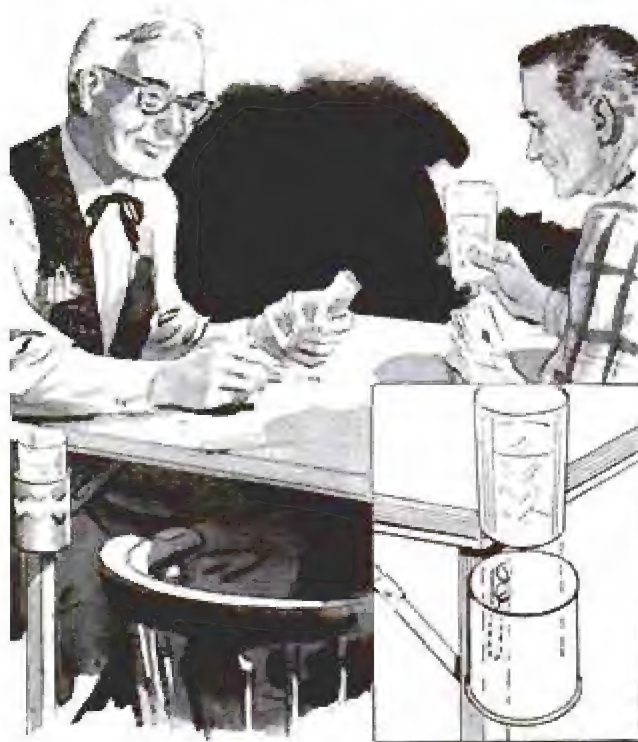
To build a cab such as this for your truck, first find the inside dimensions of the box so that full-size patterns of the end panels can be made. For a pleasing appearance, the roof should be curved to match the top of the truck cab. The cab can be made the same height as the truck cab or somewhat higher, depending upon the vertical space required. Next, trace an outline of each end, including notch locations for all battens and longitudinals, on plywood panels of the required size and cut them to shape. Notches for the battens and longitudinals, and cutouts for the windows and door, are made after laminating the end panels for accurate alignment. The back end of the cab is cut flush with the truck bed, the front end at about box-height to provide a slight overhang.

After cutting all parts of the cab, assemble them on the truck box to assure proper alignment. Battens and longitudinals are glued and screwed to the end panels, using flatheaded screws. Vertical framing members for each side window are cut from 1 x 2-in. stock and are notched and screwed to the lowest batten and a longitudinal. The batten serves as a header and a 1 x 2-in. cross piece screwed to the verticals at the bottom of the window forms a sill. Aluminum nails are used for fastening the sheet aluminum to the ends and longitudinals. Be sure to drive these nails close to the edges of the metal so that they will be covered when the aluminum angles are screwed to the end corners and bottom edges.

★ ★ ★



Holder on Card-Table Legs Prevent Spilling Beverages

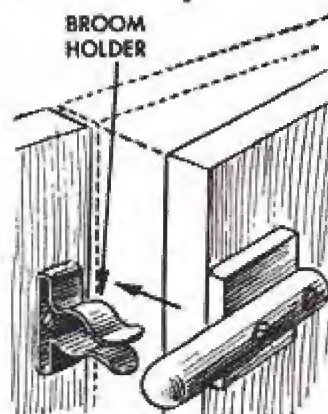


There will be no problem of having beverage glasses knocked over accidentally if they are kept off the top of a card table by being placed in holders on each leg. The holders are food tins of a suitable size with keyhole slots cut near their upper edges. Each holder is fitted over a pair of round-headed screws driven into a table leg. Using two screws prevents the holder from being tipped. These holders also may be used as ash receptacles. The outsides can be painted or otherwise decorated.

Enno R. Haan, Evanston, Ill.

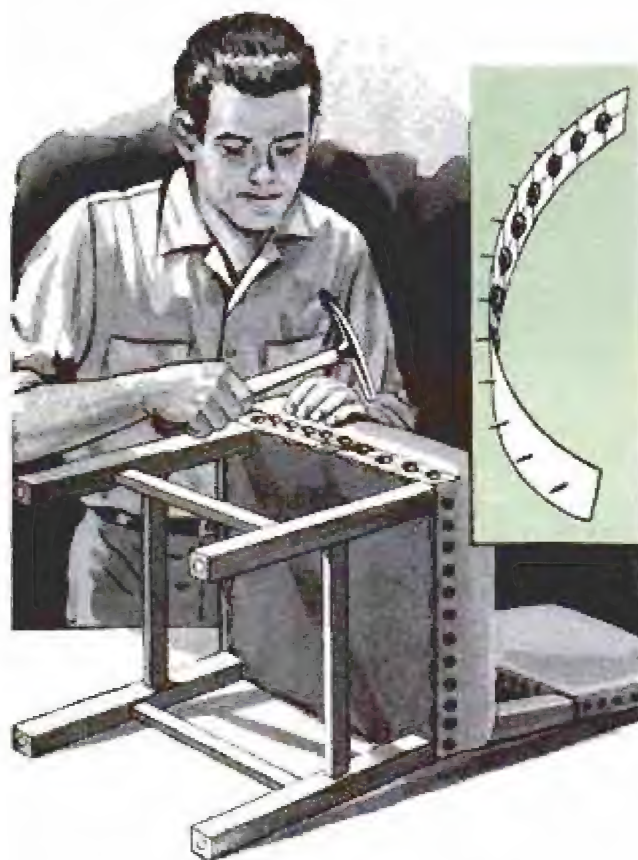
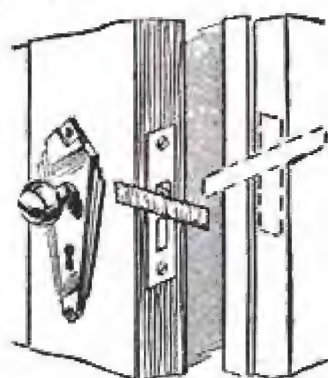
Latch for Garage Doors Made From Broomstick and Clamp

Consisting of a length of broomstick screwed to one door and a spring-type broom clamp on the other, this "friction latch" eliminates need for locking and unlocking swinging-type garage doors whenever a car is taken out.



Tape Locates Strike Plate On Newly Hung Door

Pencil marks need not be made on a newly hung door to mark location of the strike plate on the casing. Press a piece of tape to the face of the door, in line with the latch, allowing it to project beyond the edge. Then close the door and press the projecting tape onto the casing and peel the opposite end from the door. When the door is opened, the tape on the casing marks the latch position.



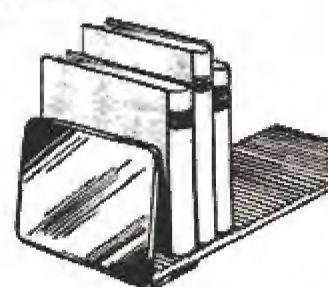
Driving Evenly Spaced Tacks

When driving a number of tacks that must be spaced evenly, first fit the tacks into a strip of paper marked in equidistant spaces. Place the paper strip over the work and tap each tack into place. Before making the final tap to set the tacks, pull on the paper to tear it free.

M. Robert Beasley, Jackson, Mich.

Utilizing Single Bookend

Fastening a strip of thin striated plywood to a single bookend as indicated makes it possible to use the single unit to hold a number of books upright.



"Frame It" With Your Camera

By Grover Brinkman

FRAMING an outdoor scene on film—using an arch, doorway, tree or any natural object to form a border as shown in the photos illustrating this article, not only produces a better photo but also, teaches you to become a better photographer. Since such framing objects usually occur in the foreground, a feeling of depth is added to the photo that is especially desirable for pictorial shots. In many instances, framing a picture in this way is just as important as giving it the proper exposure. Without



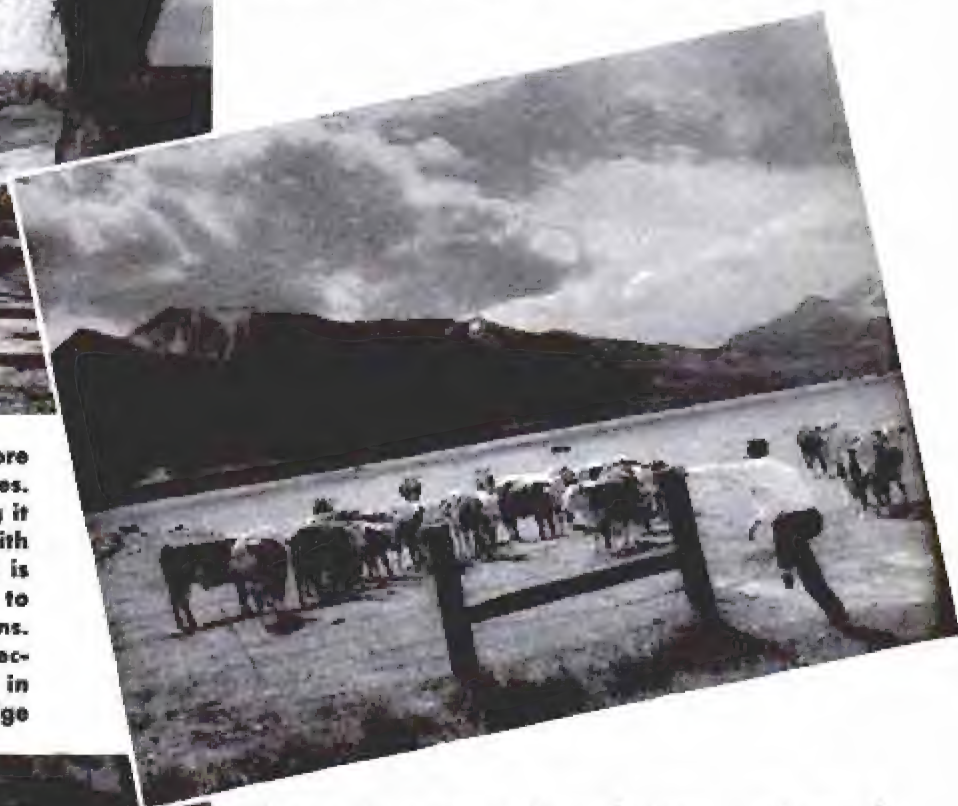
Vertical lines are strongly accented with subject framed by foreground buildings that are spaced close to each other

Opening in side of covered bridge sets boundaries of panorama while figure provides a center of interest





Above, ordinary subject is made more interesting by framing it with trees. Barn is spotlighted by underexposing it when making enlargement. Right, with no "frame" available, outdoor shot is improved by using yellow filter to darken clouds and distant mountains. Below, partial frame is just as effective as full one. Overhanging limb in foreground directs attention to bridge



it, you produce only an uninteresting routine shot. Whether you are taking a picture of a scenic view, commercial subjects or human-interest situation, what you see through the camera's viewer isn't nearly as important as how it is handled. Walk about a bit and view the shot from several different angles, all the time deliberately searching for a suitable frame.

For many photographic situations a simple frame will do, such as an opening in a clump of trees, a doorway through which a scene or subject can be viewed, or a narrow space between buildings that frame another building in the background, as

shown in one of the photos. Arches of bridge spans and other structures afford excellent frames, especially when shot at an angle to create depth and eye movement. Subjects or scenery that are framed by spoked wheels, loops in a rope, knot-holes and other unusual setups usually are quite interesting because of the novel treatment.

Sometimes the frame creates atmosphere, in addition to its use as a border. The rough-finished appearance of the wood in the door and doorway shown in the lower left photo on page 147, provides a rustic setting for the antique gun and log cabin framed by them. The oil derrick framed by the familiar oil-field pump compels you to think of oil, although the subject in this case, the derrick, is too far away. There are times when the subject itself provides the frame, as in the case of the two boys attempting to align the front wheel of a bicycle. Anyone who has owned a bike, is instantly reminded of his own experi-



ences along these lines. Frames such as these quickly identify the subject and help the viewer to understand the story or action portrayed by the photo with little or no verbal explanation.

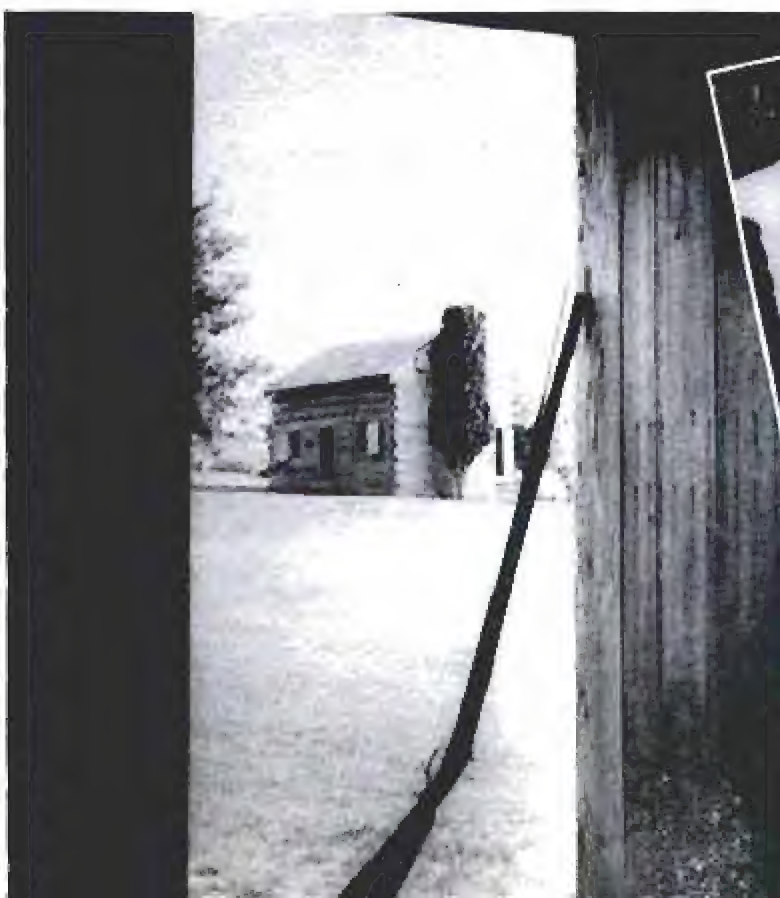
Some professionals are so conscious of framing advantages that they try to include some type of modified framing in each shot attempted. Even when an outdoor shot does not lend itself to easy framing, lens filters are used to lighten shadows in clouds, hills and mountains on the exposure so that they will print dark on the finished picture to direct attention to the foreground of it as in the tilted photo, page 146.

★ ★ ★



Upper left, here is an example of ineffective framing. Oil derrick on horizon is too far away from the oil-well pump, resulting in overemphasis on the frame

Above, a novel but effective frame is bicycle wheel that sets mood of wheel-alignment situation and serves to outline most important element of photo



Above, arch of bridge span and supporting piers at each end frame top and sides of photo, pilings in water the bottom. Left, texture of the grain on doorway provides an atmosphere for antique gun and old log cabin accented by the frame



Paint-Scraping Tool Cleaned On File Attached to Ladder

Scraping softened paint from a wooden surface, such as the side of a building, usually produces the problem of keeping the scraping tool clean for maximum efficiency. One method of cleaning the tool is to force a discarded file into a hole drilled in a ladder rail as indicated. Scraping the tool on the edge of the file will clean it of accumulated paint. When the paint-scraping job is done, the file is removed from the ladder, and can be discarded or saved to be used on the next paint-removal project.



Shoe Scraper on Ladder Reduces Accident Hazard

To avoid the recurrence of an accident caused by slippery clay and mud on ladder rungs, one painter fitted his ladders with $\frac{1}{4} \times 1\frac{1}{2}$ -in. flat-steel cross pieces below the bottom rung to serve as mud scrapers. The ends were bent at right angles to fit snugly between the ladder rails, and were drilled to receive two $\frac{1}{4}$ -in. bolts at each end to hold the scraper securely and prevent it from turning.

Scarecrow "Flies" in Tree

Keeping hungry birds out of fruit trees requires a scarecrow that can "fly." Such a scarecrow can be made by sticking three long feathers into a potato to simulate wings and a tail. Hang the "bird" on a long cord so it rotates easily in the wind.

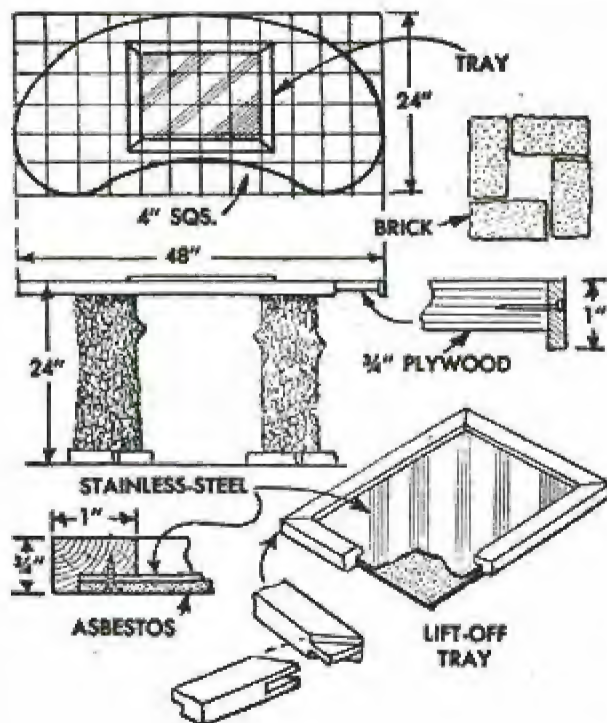
Leslie G. Schultz, Chicago.

Dead Vines Quickly Removed From Fence With Wire Brush



Instead of spending a lot of time hand-picking dead vines from a woven-wire fence or trellis, or burning the vines, with subsequent damage to the wire, use a wire brush for the job. Not only does the brush make quick work of removing the vines, but at the same time it is used to remove loose rust from the wire to prepare it for a coat of rustproofing paint. The simplest and fastest method of applying paint to a wire fence is to use a roller specifically designed for the job. The paint used should, of course, be of a type that is nonpoisonous to plant life.

❑ If rust stains on concrete are not too heavy, they can be removed by rubbing them with sandpaper, rather than covering them with paint.—Anton Wilczak, Chicago.



Outdoor Table Has Heatproof Tray for Brazier

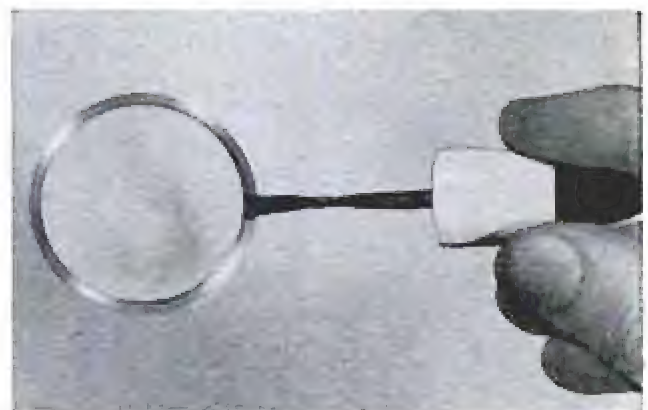
This kidney-shaped table is designed especially to hold a table-top brazier, so often used when doing back-yard cooking for just a few people. There also is ample space on the table for dishes and utensils used with the brazier. When the cooking equipment is stored away, the table remains as an attractive piece of yard furniture, and can be used for serving cooling drinks and sandwiches. The lift-off tray has a bottom consisting of a sheet of stainless steel over a piece of asbestos to provide a heat shield for the table, and to contain any hot grease spilled from the cooker.

When the brazier is removed, the tray can be used for serving beverages and snacks. Two lengths of tree trunk, their ends cut as square and parallel as possible, are the "legs" of the table. Bricks, arranged as shown in the detail, are used to hold the lower ends of the legs in place. For a more permanent installation, the legs can be set in concrete. The plywood top of the table, which is removable for storage during bad weather, is trimmed with a 1-in. strip of wood, plastic or metal. The top should be given several coats of paint, and the tree trunks treated with wood preservative.



Removing Marks From Negatives

Fingerprints and abrasion marks can be "polished" from film negatives by gently rubbing them with silicone-treated eye-glass tissues. Use a fresh tissue for each mark, and lay the negative on a clean, dust-free sheet of paper. The tissues are widely available under different brand names.



Polish Shows Lens Direction

To be sure of not mounting a close-up lens backwards, apply a thin coat of bright nail polish to the rear edge of the frame. Should the lens be inserted in the wrong way, the ring of color will show, even when the lens has been screwed into the lens-mounting attachment on the camera.

Solving HOME PROBLEMS



YOUR ANGEL-FOOD CAKE PAN will come in quite handy when cutting sweet corn off the cob. The spout holds the cob steady and round pan catches kernels

WIDE RUBBER BANDS, lettered with ink or marking fluid, provide quick-change labels for glass bottles. Simpler than paper labels and they won't come off



AN OPEN SAFETY PIN taped to the inside of your medicine cabinet will keep an eye dropper handy and safe from breakage. Adhesive tape will hold the pin

VIEWING NOTCH in a color swatch makes it easier to judge compatible colors when selecting drapery and other fabrics. Vee lets swatch "surround" fabric





A PIPE CLEANER does a good job of cleaning an electric razor when the regular cleaning brush is misplaced. Bend the cleaner double and use as in photo



A MILK NOTE won't get poked down in a bottle if you place it inside a drinking glass as shown. Milkman can read it easily, can't get wet or blow away



SOAP RUBBED ON HANDS serves as invisible "gloves" when doing dirty work by keeping grime from pores of skin. Soap coating makes hands easy to wash later



NOVEL PLACE MARKERS are made by blowing up balloons, marking them with nail polish, and pulling knotted ends through paper cup. Disks provide collars

CHAIN LINKS knotted to the ends of an indoor clothesline make it a simple matter to put it up and take it down when you have just a few things to dry

WOBBLY TUBULAR FURNITURE with fitted rubber tips can be leveled in a simple manner by dropping a washer or two inside the cup end to lengthen the leg





and bring the spacious outdoors inside. Low-priced photomurals in full color bring the seashore and mountains right to your door in breathtaking panoramic scenes. Easily applied like wallpaper by anyone. Adds glamour to any room



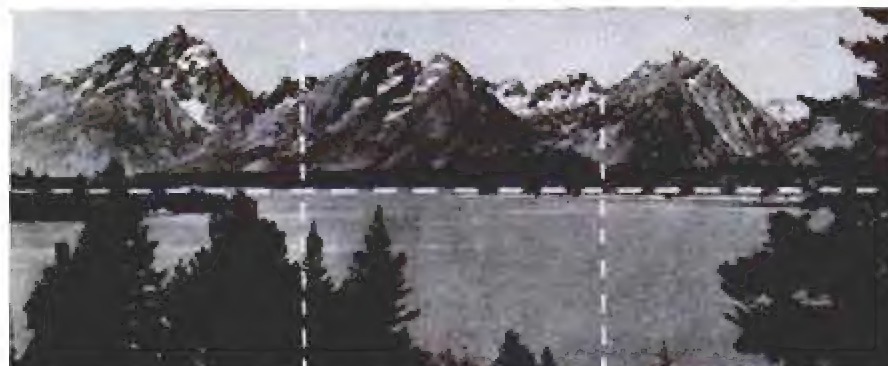
If papered wall is in good condition, mural sections can be applied over old paper. Note "brick" wainscoting

NOW YOU CAN have a room with a view—and what a view! You can live alongside a peaceful, lazy-flowing river, near a beach bathed in glorious sunshine or by a shimmering lake mirroring the grandeur of snow-capped mountains. It's all made possible with giant photomurals that are available in color at low cost. The murals shown are produced by Louis F.

Dow Co. from photos of the actual scenes.

Murals offer all kinds of decorating possibilities in every room of the house, including the basement. Large enough to practically cover an entire wall, they can be used to make a small room seem twice as large. You can create a huge picture-window effect by hanging draperies at each side and a valance board at the top. A mural can be used around

Available in three different scenes, here is how the giant 74 x 174-in. murals are divided into six separate sections pretrimmed for matching



the corner of a breakfast nook to liven it up, and by repeating the matching sections, a continuous panoramic scene can be applied to the long wall of a basement recreation room. Model-railroad hobbyists will find such murals ideal as a backdrop for track layouts.

Complete murals come in three and six sections. The three-section one



Similar to the effect of a picture window, this giant mural of The Grand Tetons gives a spacious feeling to a small room

measures $38\frac{1}{2} \times 174$ in. and consists of two standard sections and a center reverse section. The six-section mural gives you a giant one measuring 74×174 in. Individual sections, $38\frac{1}{2} \times 58$ in., either framed or unframed, are available for use as large wall pictures over fireplaces. In fact, you can buy one-section murals in kit form which contain everything for framing, including premitered frame molding. All sections come accurately trimmed for perfect matching, are varnish-coated for wiping clean and are lithographed in non-fading inks.

The murals can be hung on most any surface as long as it is smooth. Ideal surfaces are smooth plaster, hardboard, fiber wallboard, and other composition standard wallboards. Where applied to plywood, it is recommended that the surface be sanded and finished with a pigmented undercoater to eliminate the wood grain which otherwise might show through the mural. Cracks in plastered walls and seams in wallboard should first be





Cypress Gardens, above, is a six-section mural. It is also among a selection of some 17 different murals measuring $38\frac{1}{2} \times 58$ in. Widgeons and Sentinels, below left, are among other popular murals you can pick

carefully filled and sanded. In most room installations, a wainscoting of wood paneling or imitation plastic brick is used below the mural and applied across the top of the baseboard.

Being of heavier paper than regular wallpaper you don't need to worry too much about tearing when hanging. Use any good quality wheat paste and mix it to the consistency of buttermilk. Let the paste stand 20 to 30 min. before applying it to the back of the mural with a wide, soft brush. Fold the pasted side back-to-back as is done in hanging wallpaper but do not crease the paper sharply since creasing may break the surface finish. Allow the paste to soak the paper 3 to 5 min., depending on atmospheric humidity, but do not oversoak. Work out all air pockets and wrinkles with a regular smoothing brush, and immediately after hanging, wipe off the entire surface gently with a clean, damp cloth to remove any excess paste before it dries. If slight "puckering" appears, leave it alone since it will disappear when the paper dries and contracts to its original state. The matching sections are designed and trimmed for butting and should not be lapped, since a ridge would show. Also, it is best to paste and work with just one section at a time to avoid oversoaking. ★ ★ ★



White hamper being spattered pink, carnation, gold

Spatter- SPRAY IT!

YOU'RE IN FOR a decorating treat when it comes to rejuvenating all kinds of household items which have taken on a used and worn look. Such things as metal wastebaskets, dustpans, canisters, hampers and countless other articles can be given new eye-appeal when sprayed and spattered with a 'fetti nozzle which is available with Martin-Senour Co. spray enamel. Having a large orifice as compared to the conventional fine one, this extra "switch over" spray head produces a spatter effect normally achieved by the tooth-brush method, but now conveniently accomplished by spray. In less than four hours, including drying time, you can spatter-spray everything but the proverbial kitchen sink. Even a worn linoleum floor can be made to look new again by giving it the confetti treatment.

The examples here show what can be



Above, personalized lunch box was done in tahoe blue, masked and sprayed with sky blue and then spattered with tahoe blue and turquoise. Below, center of black tray was done in carnation and spattered white, silver and black with 'fetti nozzle



Above, house-worn wastebasket and dustpan are matching things of beauty when given an over-all base coat of primrose yellow, then masked and sprayed pumpkin and finally spattered coppertone. Below, stripes and dots can be used to brighten up has-been canister set. Turquoise and white, spattered gold, are used in one example. White and lobster, spattered white and lobster, are used in other





Here is the attractive design you get by using a doily stencil and following the four steps pictured at the right

done with only spattering, and by combining masking and spattering. In the latter case, paper cutouts in leaf shapes and other forms are applied during the process to produce interesting designs in silhouette. Use fairly heavy paper for the stencils, or masks, and avoid newspaper as the print may transfer through. Regular masking tape (the flat, rather than the crepe variety) can be used also. Lacy silhouette patterns can be produced by using common paper doilies as stencils, cutting away portions of them to form interesting designs. An example of what can be done with a doily is shown above. Here the tray was first sprayed light blue, then masked and sprayed dark blue, and finally spattered with three colors—pink, light blue and gold after

Look what you can do to spark your plain TV snack trays. Note how size of masks can be varied to give novel effect



When background color has dried, paper-doiily stencil is applied after dampening with water



Silhouette is formed by spraying a contrasting second color with regular fine-spray head



Let spray coat set a few minutes, then carefully lift off stencil with the point of a knife

Switch to 'fetti nozzle and spatter. When in actual use, spray should be held 3 feet away





Leaf sprays, such as these, which are cut from paper and wetted to hold them flat, form ivory silhouettes when sprayed mint green and then peeled from tray

removing the stencil. If you want a clear silhouette, sharply outlined, spatter the work with the stencil or mask in place.

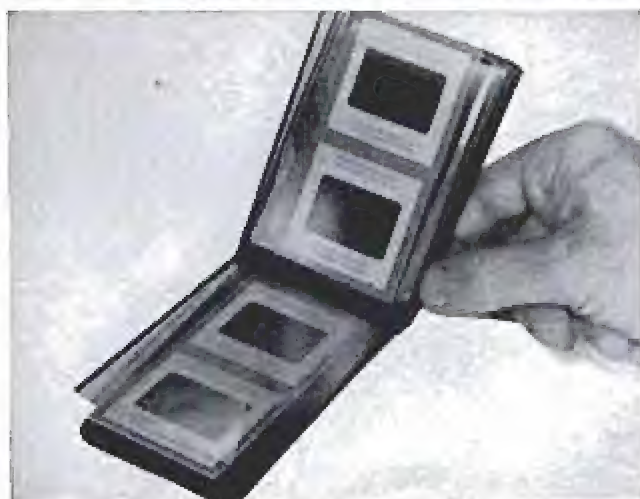
Practice First

The right spattering technique comes with practice; you can get the feel of it by first experimenting on a test surface. Spraying is done at a greater distance when you switch over to the 'fetti nozzle. Where 14 in. away is about right when using the fine-spray head, you should now hold the can about 3 ft. away. Make swift side-to-side passes and stop to examine the spatter. Two or three passes are generally enough. Spatter colors look best when done lightly. Too heavy a spatter coat will obscure the pattern. For a strong speckle



or spatter effect, use sharp light-and-dark contrasts, such as black on white, charcoal brown on cream, dark blue on light blue or pink on carnation. Strong color contrasts such as red and green, or blue and orange, will yield a muddy effect. The four painting steps required are pictured in the series of photos shown on the opposite page. In each case, you always start with a base or background color which you apply with the conventional fine-spray head. Here, the general practice is to spray two fine coats about 10 min. apart. You'll have less trouble with runs and sags if you do. Let the base coat air dry about 2 hr. before applying your stencil. A variation in the silhouette treatment is had by outlining the stencil with the fine-spray head and letting the spray coat feather off into the background coat rather than spray the entire base coat with the second color. ★ ★ ★

Billfold Makes Show-Off Album for Prize Color Slides



Prized color slides of your family, the new baby or your home, are safe from handling and yet convenient for showing off to your friends when carried in the plastic sleeves of your billfold. Each sleeve will

hold two 35-mm. slides nicely and permits them to be viewed without having to remove them.—John J. Rea, Urbana, Ill.

❏ Soiled plaster-of-paris statuettes will take on a new look if they are dipped in a solution of starch and water; then buffed with a soft brush when thoroughly dry.

Pilot-Lighting Flash Shots

In pilot-lighting a shot to be flashed, you'll find that regular 250-watt, 3200-deg. Kelvin bulbs are better than photofloods. They have longer life and greater intensity than 100-watt photoflood bulbs. When switching over to flash bulbs just before making the exposure, you should use extenders in the reflectors to bring the smaller flash bulb into the same relative position as the pilot bulb.

Clyde L. Allison, Cadillac, Mich.



MOTHER'S COOKING may put a tingle into your taste buds, but there is nothing like food cooked outdoors over an open fire for gastronomic ecstasy. Fresh air and tangy wood smoke combine to give steak and other food a flavor that an electric heating element or gas burner cannot duplicate. But you must know how to cook outdoors before you rush off to the woods

Two forked stakes driven in ground on opposite sides of fire support pole from which one or more pots may be hung. When cooking is completed, pole is swung away from flame to third stake for safe cooling

with raw meat and matches. A type of fire that is suitable for one purpose and utensil, usually isn't satisfactory for another cooking situation, as illustrated in this article. So that you will know how to make most types of outdoor cooking fires the next time you go on a camping trip, clip these pages from the magazine and store them with the camp cooking gear. ★ ★ ★

Best way to bake potatoes is to wrap them in aluminum foil and place in fire. Foil retains natural juices for faster baking and tastier eating. Same method is used for roasting corn and broiling meat





Upper left, trench fire is handy for frying eggs on grill of green poles placed across top. Small pot with wire bail is suspended over flame at other end of trench from forked stake angled over fire

Above, chicken is broiled on skewer from fire below, and baked from side due to heat deflected by logs stacked against two stakes driven into ground at slightly more than right angle to one end of fire

Left, fire from dry poles, arranged in cone shape in hole dug in ground, provides excellent heat for shishkabob broiling, as well as other types of cooking. Forked stakes are handy holders for skewer

Below, when fire is built between two logs, flame is confined to small area for faster broiling of steaks and other meats. Logs provide convenient surfaces on which to rest wire grill between turns



Below, heavy frying pan is positioned over fire by fitting it in notches cut in sides of two fairly large logs. Short length of limb left on each log is forced into ground to prevent them from rolling





Photo Sponge Kept Dustfree If Stored in Foil Envelope

It is imperative that all photo-developing equipment be kept scrupulously clean and this is especially true of items such as sponges that actually come in contact with the film. A single grain of dirt can scratch and ruin a negative or print. Sponges can be kept dust and dirtfree by using an aluminum-foil envelope in which cut film is packaged. When opening the envelope cut it carefully so the foil is not damaged. The sponge then is slipped into the envelope and the foil edges turned down and folded to make a dusttight seal. The sponge should, of course, be cleaned thoroughly and completely dried before storing in dustfree envelope.



Photoprint Curling Prevented

Photographers who dry prints with an electric dryer may find that single-weight prints tend to curl toward the emulsion side. To straighten them, stack them face to face under a weight until thoroughly dry. The opposing curls will counteract, flattening the prints. Another way to assure flat prints is to soak them in a gloss solution prior to drying. The gloss serves as a moisture-absorbing agent to prevent shrinking of the emulsion which causes curling.—Robert C. Florian, Chicago.



Tab Over View-Finder Opening Indicates Lens Is Covered

There will be no chance of wasting pictures with a lens cap in place, if a tab on the cap is positioned to also cover the viewfinder. The tab is a piece of stiff cardboard cut to fit around the lens cap and cemented to it as indicated. A glance through the viewfinder will show it blocked, indicating the lens cap is in place.

Walter Gottlieb, New York City.

Thermometer in Filler Tube Indicates Water Temperature

Fitting a thermometer in the filler tube of the wash tanks in his darkroom permits one photo enthusiast to keep a constant



check of the water temperature. The tube is assembled as shown from $\frac{3}{8}$ -in. copper tubing and fittings. The metal plate of the thermometer is shortened and narrowed, then soldered to the tubing to support the glass column. The end of the latter fits in a rubber washer in the tubing to make a watertight fit. A length of rubber hose connects the filler tube to a mixing faucet. The hook shape fits on the edge of the tank.

I. Clyde Cornog, Philadelphia, Pa.

☐ Cotton swabs can serve to touch up furniture scratches with stain and varnish.

Simple Sandbox of Rugged Construction

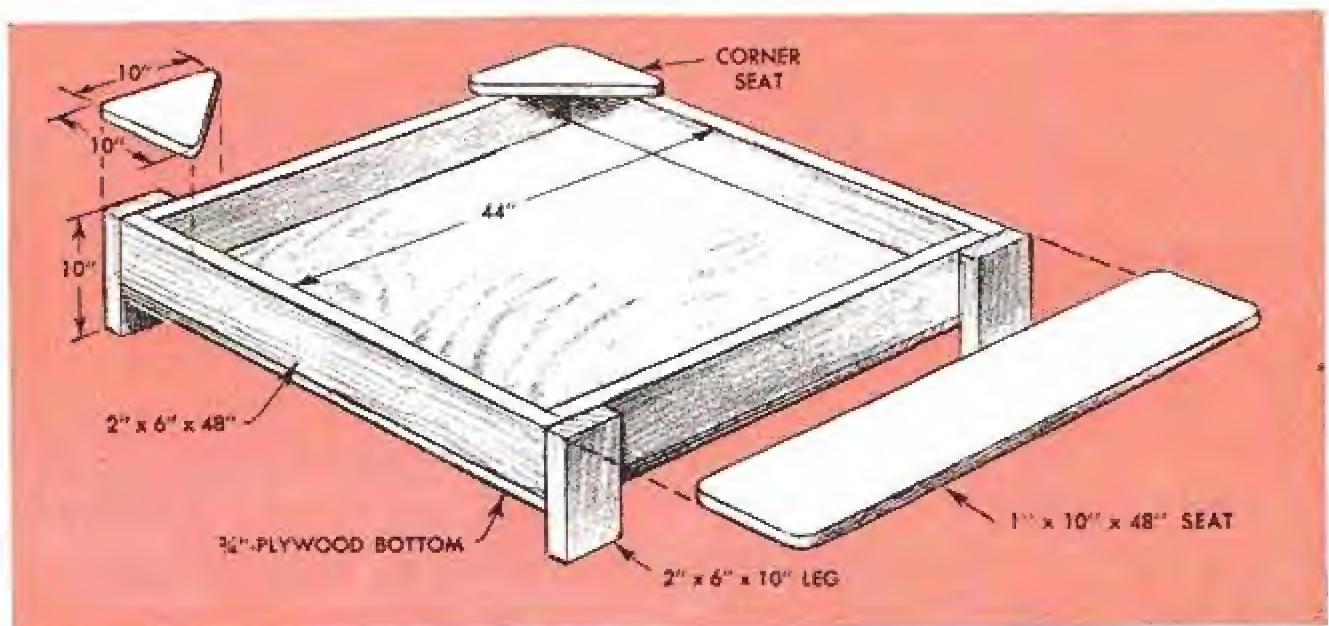


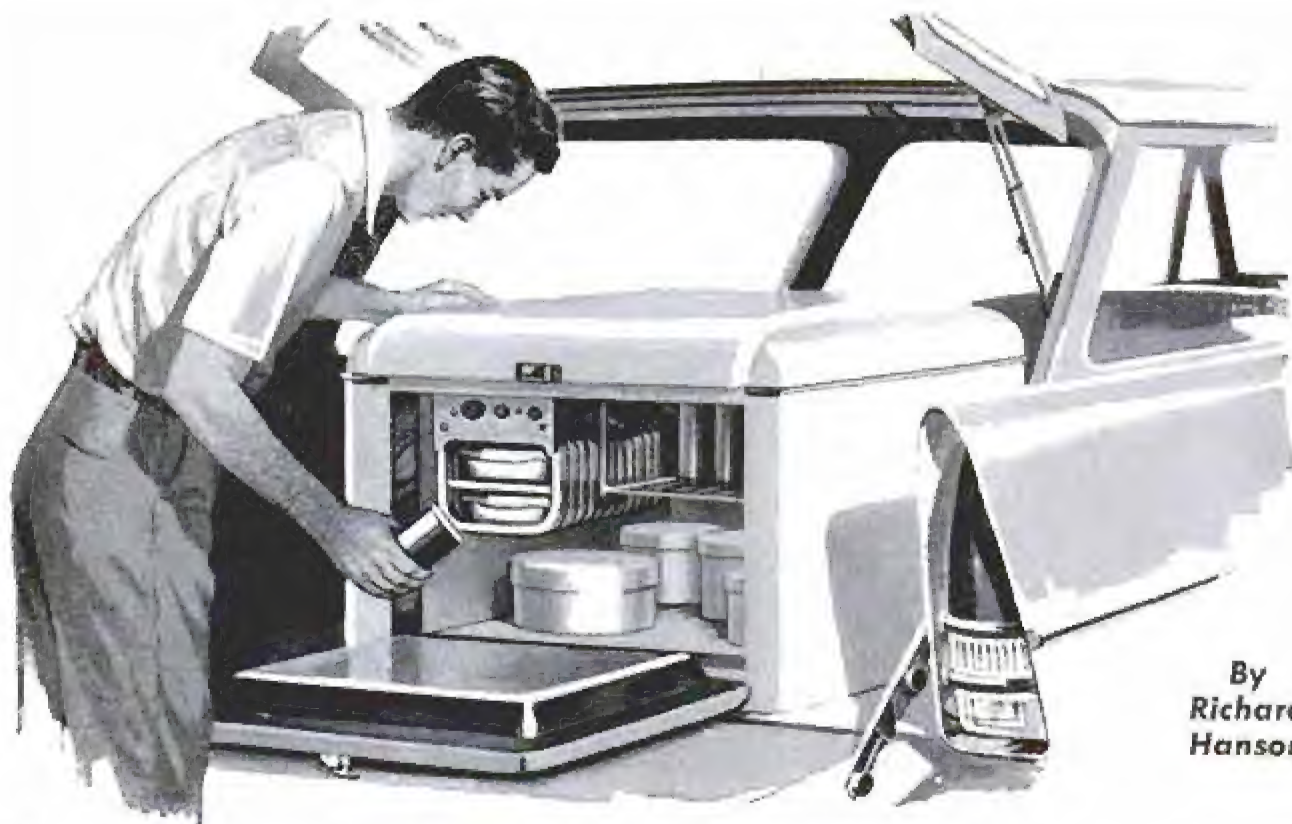
LET THE TOTS in your family dig in sand to their hearts' content in a small but sturdy sandbox, such as the one shown, that you can make in less time than it takes to go out and shop for one. The sides, ends and legs are cut from 2 x 6-in. pine lumber according to the dimensions given in the drawing below. The two corner seats and one long end seat are cut from 1-in. stock while the bottom is cut from $\frac{3}{4}$ -in. exterior-grade fir plywood. All mem-

bers are assembled with glue and screws as indicated.

To prevent injury from splinters, all edges and corners of the seats are rounded with sandpaper. The completed sandbox is given two coats of exterior paint. For a pleasing contrast, the seats may be painted a lighter or darker color than the rest of the box.

To accommodate older children, simply increase the length and width of the sandbox dimensions.—Howard Fenn, Chicago.





By
Richard
Hanson

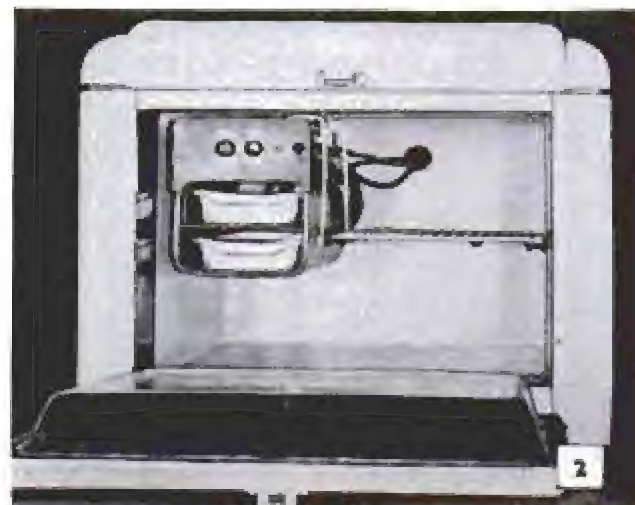
Automobile-Sized Refrigerator

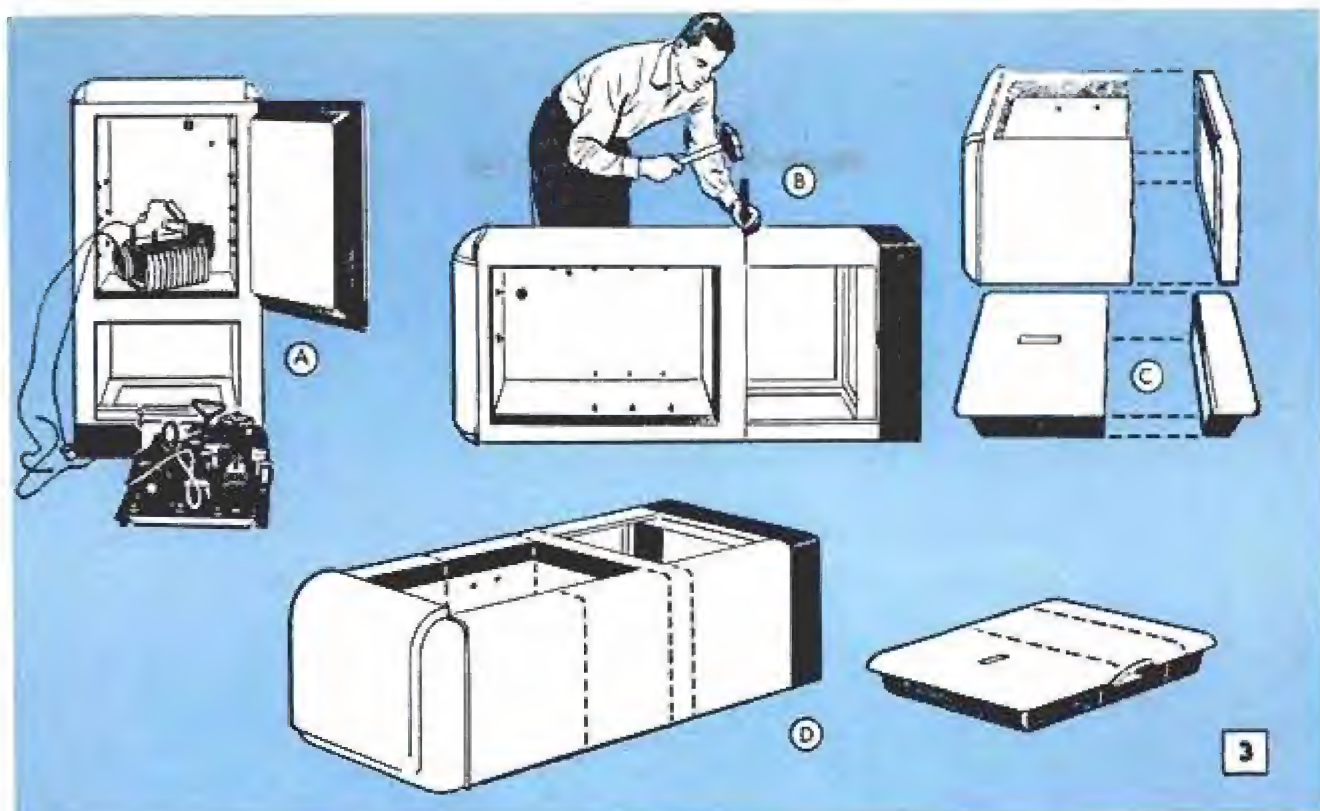
CONSIDERED an accessory for automobiles of the future, an electric refrigerator can be installed in your car now, if you make it yourself. Start with an older model refrigerator, preferably a small, apartment size. Remove the evaporator and compressor units, detail A, Fig. 3. The evaporator, Figs. 2, 4 and 5 contains the ice-cube trays. Mark the various tubes and wires before disconnecting, so there is no problem when the unit is reassembled. The compressor unit, Figs. 6, 7 and 8 is left on its frame. Next, remove the door, its hinges and latch, and cut off the lower portion of the refrigerator in which the compressor unit was located, details B and

D, Fig. 3. Now, "section" the refrigerator cabinet and door, details C and D, Fig. 3. The height of the removed sections is determined by the desired height of the finished refrigerator. The original was dimensioned to fit in the trunk of a sedan, Fig. 1. If the refrigerator is to be used in a station wagon, as illustrated, its height could be greater. If welding equipment is available, the edges of the rejoined door and cabinet sections are butt welded after removing the insulation. Otherwise, allow a ½-in. lap on one of the sections and assemble them with sheet metal screws. The lap joints should be sealed with a metallic adhesive, of the type that consists

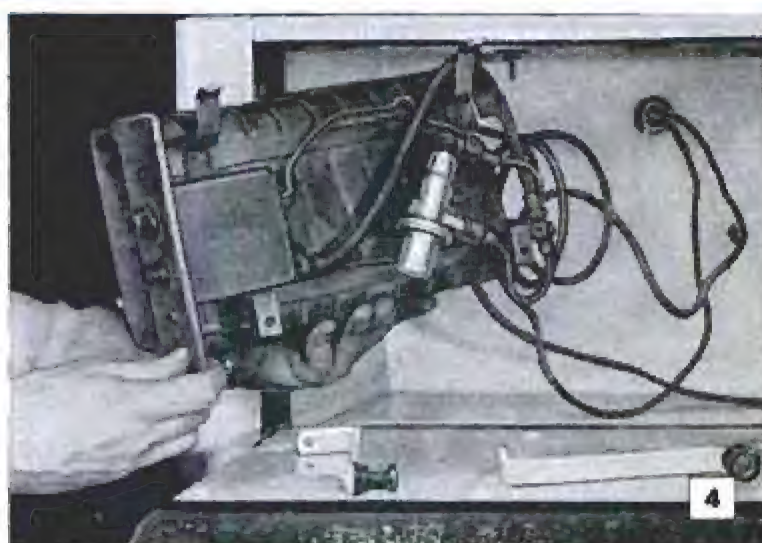
Finished refrigerator is neat and compact, fits handily in car trunk or in the back of station wagon

Refrigerator opened to show location of evaporator, installation of shelf with fabricated metal brackets

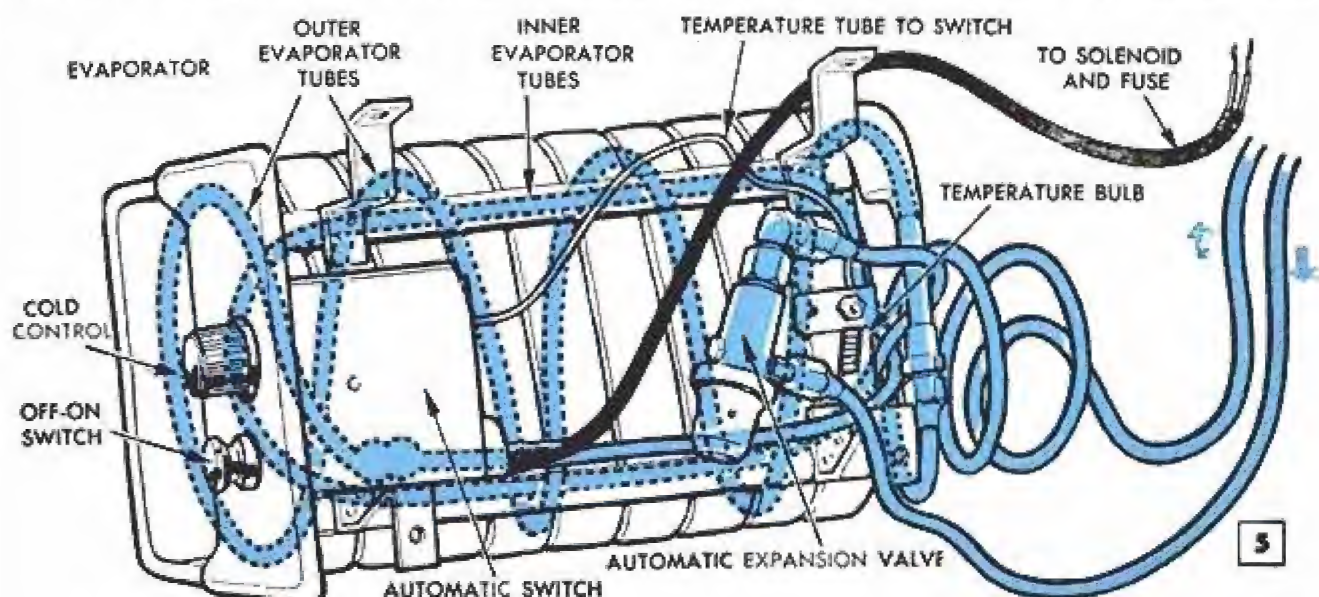


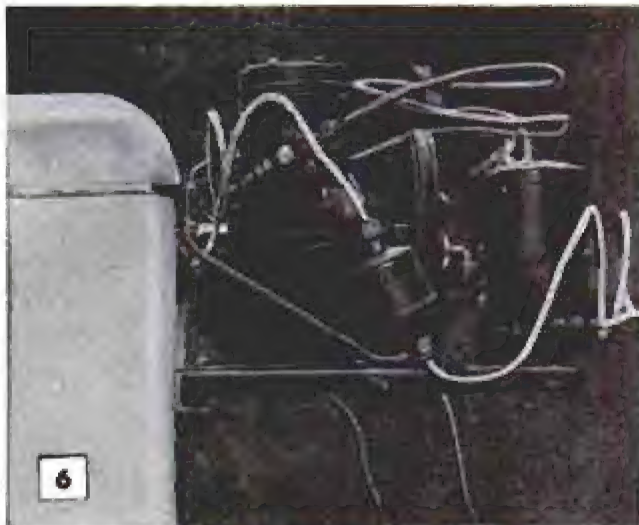


of powdered metal mixed with a resin. Replace all insulation, sand all joints smooth and paint the door and cabinet with refrigerator enamel. The door now is rehung, using cabinet hinges and latch. For greater accessibility, hinge the door at the bottom. Replace the evaporator in the cabinet, reshaping and changing brackets, if necessary. Reconnect tubing and wires, making sure all joints are tight. The compressor platform now is mounted on the back of the cabinet, left-hand detail, Fig. 9, using steel angles and flats. The 110-volt motor in the compressor assembly must be replaced with a 6 or 12-volt (depending on the car



Above is shown method of attaching compressor-unit platform to cabinet and the manner of hanging door





Above, compressor unit attached to back of refrigerator cabinet is out in the open, easy to service

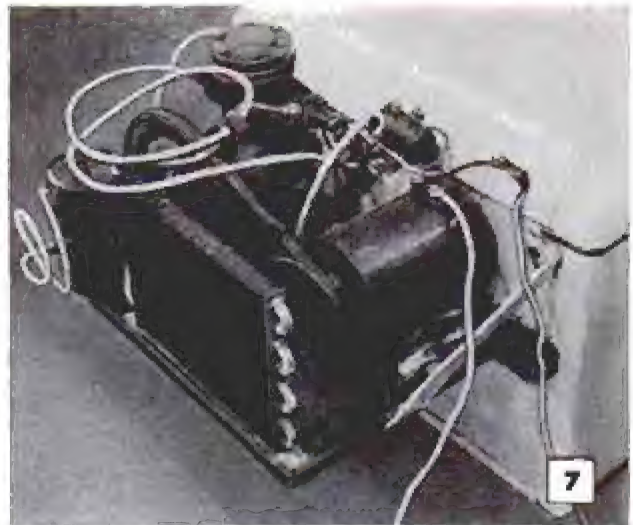
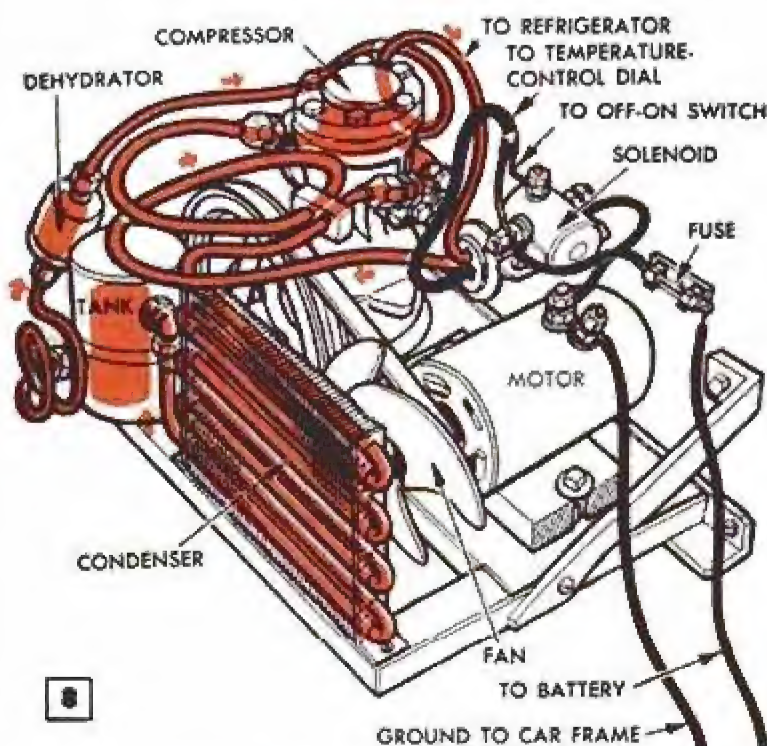


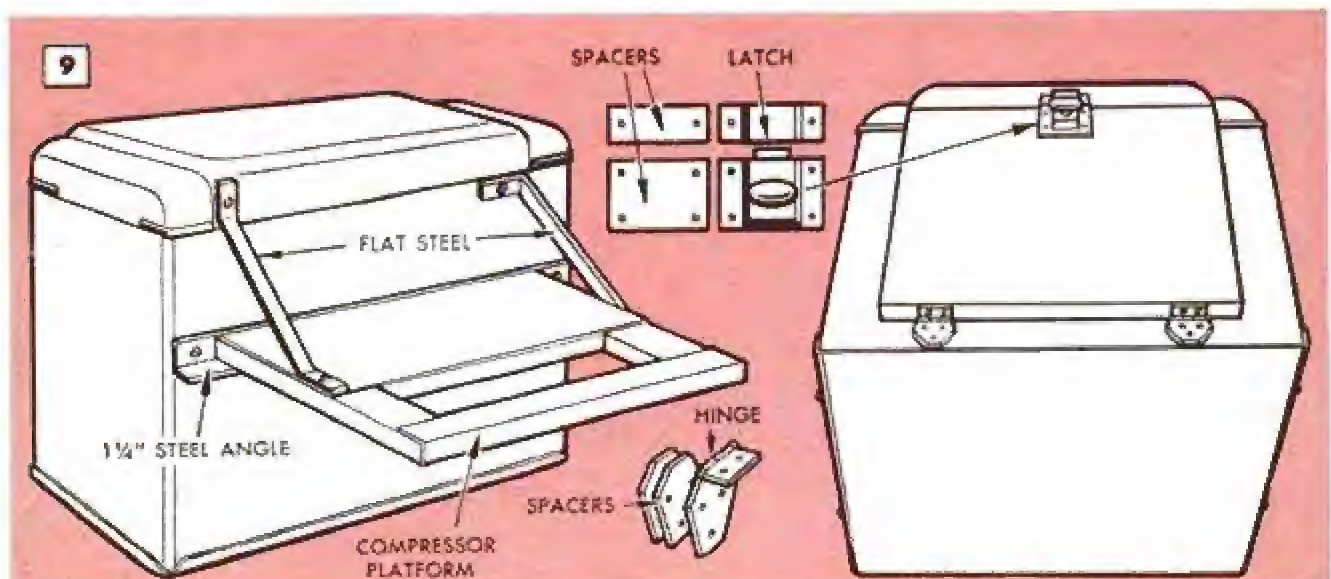
Photo of compressor unit above shows new motor, auto-starter solenoid and fused wire from battery



electrical system) d.c. motor of $\frac{1}{6}$ or $\frac{1}{4}$ hp. Such motors are available as war surplus or can be purchased new from electrical-supply houses. The motor is shimmed with wooden blocks to position it correctly. The original fan and pulley are installed on this motor. It also is necessary to wire in an auto-starter solenoid as indicated in Fig. 8, to supply the battery current to the motor. The "hot" wire is fused. If the motor rotates the wrong way, reverse the leads. After the refrigerator is completely finished, take it to a refrigerator repairman and have him install a new dehydrator, recharge the unit with refrigerant and oil it properly.

Because the compressor-unit motor will draw from 6 to 25 amperes, it is not advisable to run it very long with the car motor shut off or it will drain the battery. ★★★

Below is shown method of attaching compressor-unit platform to cabinet and the manner of hanging door



Truck Engine Aerates Minnow Can on Way to Fishing

When transporting minnows, one fisherman keeps them lively by aerating a water-filled milk can as indicated. Engine vacuum pulls the air from the can by means of a copper tube soldered in the lid and connected to a T-connection in the windshield wiper hose. Then air is forced into the can by atmospheric pressure through a tube entering near the top of the can and extending to the bottom. It is plugged and drilled as shown. All connections and tube-entrance openings must be airtight.—J. K. Layton, Lexington, Ky.



What You Should Look for When Buying a Used Boat

For the many people who get started in outboarding by purchasing a used boat, here is a rundown of important points to watch for when inspecting the boat.

First, take a trial spin in the boat to see that it handles satisfactorily. Then, have the boat taken out of the water and check the bottom. Planking should abut the transom and stem squarely and solidly. Be suspicious of cracks that could develop into troublesome leaks or encourage dry rot. Concave indentations in the bottom, caused by improper distribution of weight during storage, prevent the boat from performing properly and involve costly repairs.

Spots of rust on the paint indicate "nail sickness," and if the condition is bad the boat is due for a complete refastening job. See that frames and ribs are sound and

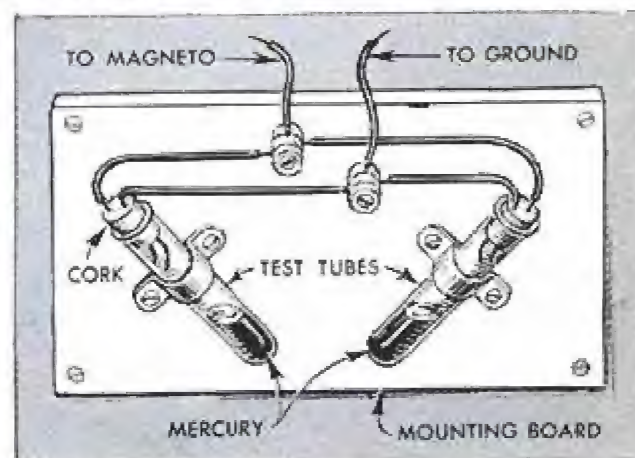
uncracked. A cracked frame will cause the planks to work and the boat to leak. Since most outboard boats are well-ventilated, the chance of finding dry rot is relatively slight—unless the boat has been covered during a prolonged storage period. A bad paint job will affect the boat's performance. This can be corrected only by sanding the hull to the bare wood and repainting it.

Aluminum and glass-fiber boats, by nature of the materials used in them are quite durable and require no refinishing. Be sure seams in an aluminum boat are correctly joined, so that they will not leak when the boat is driven by a motor of the recommended size. Glass-fiber boats should be free of cracks. Repairing these is possible, but difficult when the damage is extensive or located next to the bow.

Safety Switch Automatically Throttles "Hot Rod" Boater

To prevent his young sons from making dangerously sharp turns at high speeds, one boatowner mounted two mercury switches, made from small test tubes, on the transom of the boat and wired them into the ignition system as shown. When the boat turns at high speeds and approaches the "flip" angle, the switch on the low side of the boat short-circuits the ignition system, until a safe angle is assumed. This safety device may be used on an in-board or outboard boat and in no way will it affect engine performance.

Martin W. Stockel, Miranda, Calif.



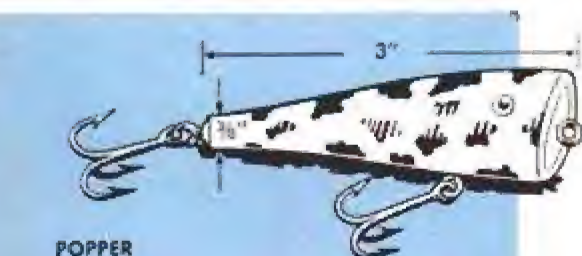
MAKING

fresh-water

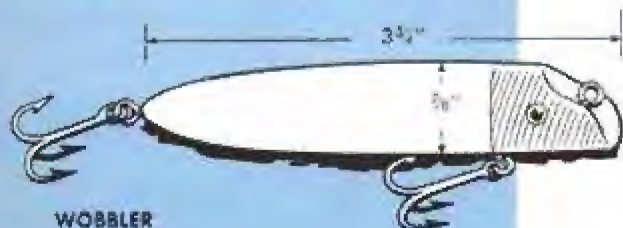


By Vlad Evanoff

POPPER



WOBLER



DARTER



UNDERWATER



JOINTED



Above, body shapes for fishing plugs. Below, spray-painting through cloth net produces "scale" effect



THERE IS NO GREATER THRILL for a real fishing enthusiast than to hook into a big one with a lure that he has made himself. Trout fishermen know this, and have made fly tying a popular hobby. What many freshwater fishermen do not know is that making plugs is just as simple, and just as personally rewarding when going after fighting game fish.

Most wooden fishing plugs are made of red or white cedar. Bass and birch also can be used, but the cedars are best, as they are worked easily and stand up well in water. If you have a wood-turning lathe, the plugs can be "mass produced," but you can do as well with a sharp knife and hand tools and each plug you make will be even more individual.

There are several basic body types used in making fresh-water fishing plugs, detail at left. The first is the popper type. This plug is about 3 in. long and has a 1-in. diameter at the large end. The tail end of the plug tapers to a diameter of $\frac{3}{8}$ in. A slight depression is carved in the squared-off face of the plug. All dimensions given for the plugs are approximate, none being critical. The second type plug is the wobbler, with a diameter of $\frac{7}{8}$ in. and tapers to a point at the tail. The diagonally cut forward end of this plug is slightly concave. Next is the darter-type plug. It is $\frac{3}{4}$ in. at the large diameter, tapering to $\frac{1}{2}$ in. A notch is cut at the head end to form a "fish mouth" and the upper surface of the head is flattened. Both the underwater and the jointed plugs are made from the same body shape, which is $\frac{3}{4}$ in. at the larger diameter, tapering to $\frac{3}{8}$ in. at the tail. The upper portion of the head is cupped and a metal "lip" is screwed to the underside of the body. Dimensions for the lip are shown in the lower, right-hand detail on the facing page. It is cut from aluminum, copper, brass or stainless steel. A ball-peen hammer is used to give the lip a cupped shape. The jointed-type plug is made by cutting the under-water body in two and rejoining the parts with brass screw eyes. After all the plug bodies have

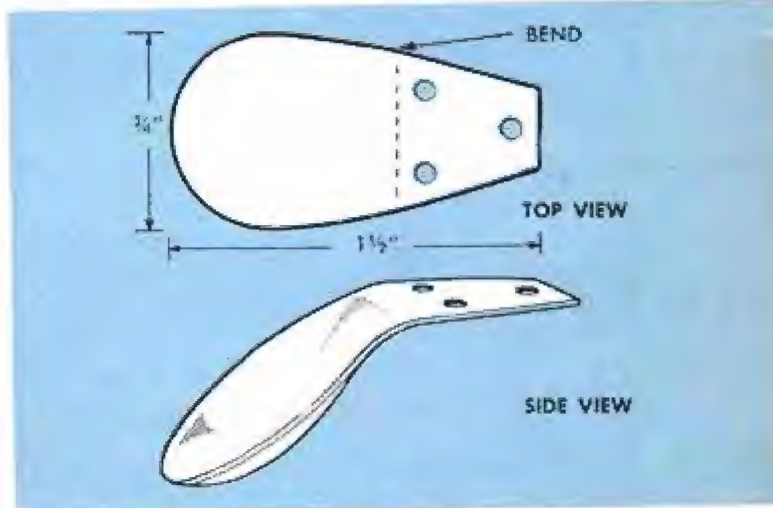
FISHING PLUGS



been shaped and sanded smooth, they should be dipped in white lacquer, then allowed to dry thoroughly. Cans of pressurized spray paint then can be used to make the plugs "two toned" by masking the area not to be painted. For a natural-fish-look, spray the top and sides of a plug with blue, green or brown, leaving the lower portion white. When the color has dried, hold the plug against a piece of cloth netting tacked to a wood frame and spray through the netting with aluminum paint to provide a glittering scale effect. The cloth netting can be obtained from the Netcraft Co., 3101 Sylvania Ave., Toledo 13, Ohio. They also have preshaped plug bodies for those who prefer assembling plugs from a kit. ★★ ★



Above, brush applies "dappled" look. Below, left, spray cans are fast, convenient. Below, metal lip



By Frank Follmer and Tom Riley

X664

Here are construction details on the most popular types of surf and paddle boards and tips on how to use them



Boards for Surf and Sail

YOU DON'T have to go to Hawaii to use a surfboard and enjoy the exhilarating thrill of racing shoreward on a long cresting wave. Surfboard enthusiasts have discovered that beaches along our own coasts and some areas of the Great Lakes provide just as much sport as the famous

Square-stern paddleboard is more buoyant than pointed-stern type while latter is faster, less stable



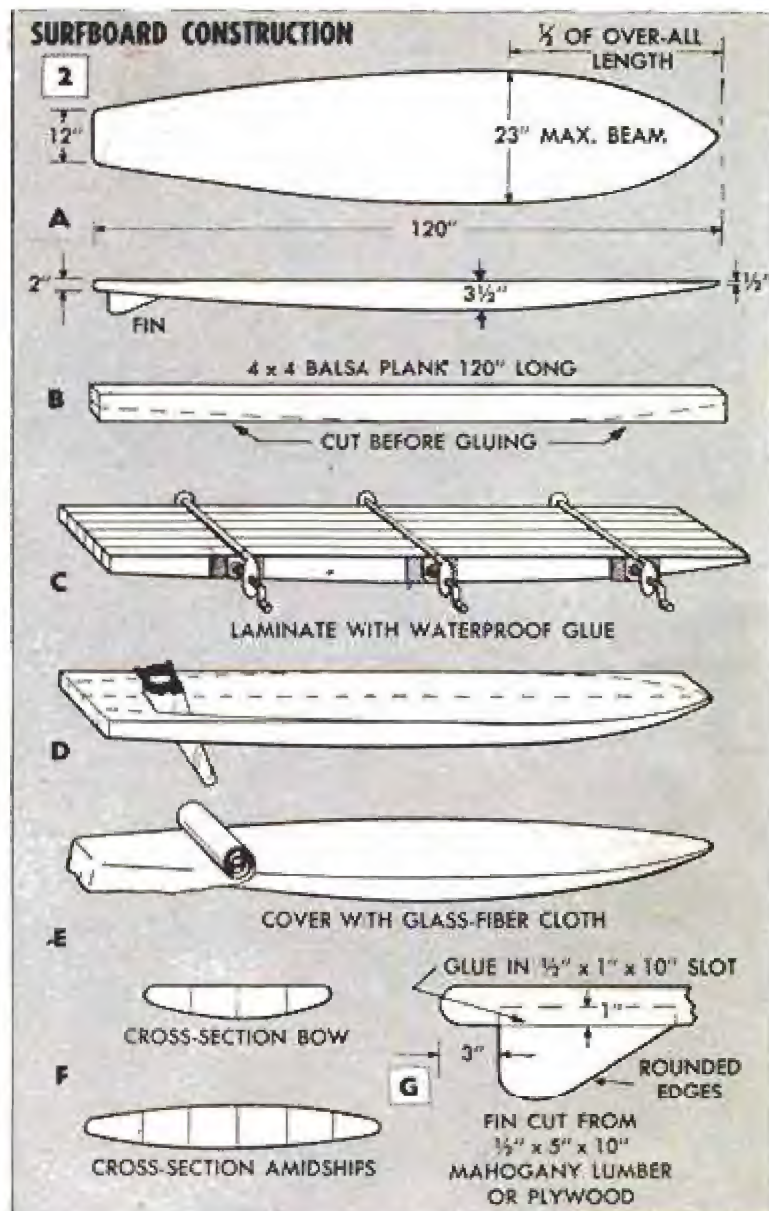
waves of Waikiki. Children and adults who prefer a less-active water sport, can use the surfboard for a paddleboard as in Fig. 3, or one of the boards that are specially designed for the latter purpose may be built as shown in Figs. 7 and 8. Also, marine life can be viewed from your paddleboard by installing a glass port in it as indicated in Fig. 9. The sailing enthusiast need only make a few changes in the paddleboard design and add some basic sailboat fittings and equipment, Fig. 4. The sailboard is easy to assemble and disassemble for carrying on top of a car.

Surfboard Construction

The surfboard shown in Fig. 2, will provide sufficient buoyancy and balance for an amateur surf rider weighing about 175 lb. However, the dimensions given are intended only to serve as a guide and can be changed to modify the gliding and floating characteristics of the board to suit the size and skill of the rider who will use it. For a smaller person, a 9 or 9½-ft. board with a maximum beam of 22 in. and maximum thickness of 3 in. is adequate. A large

person might prefer a 12-ft. board. The narrower boards are faster and are best for experienced surfboarders, while the wider boards are slower and easier to handle for beginners.

Balsa planks larger than 4 x 4 in. are difficult to obtain, therefore it is necessary to laminate several of them together to produce the required width of the blank from which the surfboard is carved, Fig. 2. Since most lumber dealers do not stock balsa lumber, allow sufficient time for filling your order. For clarity in the illustration, only three clamps are shown on the laminated blank. At least six clamps should be used for this operation. An outline of the board is traced on the blank so that it can be sawed accurately as in detail D. The sawed-out blank is then rough-shaped, using a draw knife, or a portable electric sander as in Fig. 6. All edges must be fully rounded and the sides tapered so that a cross-section of it resembles a flattened oval as in detail F. The bottom is left nearly flat from the point of maximum beam aft to the stern end. The bow section is curved more sharply as in detail A. To aid controlling the board when riding a wave, a small fin is fitted and glued in a slot cut in the after end of it as shown. The completed board is sanded smooth and covered with glass fiber, carefully following the manufacturer's



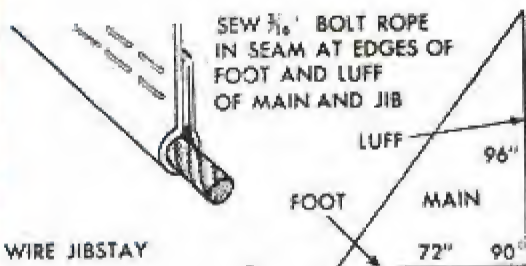
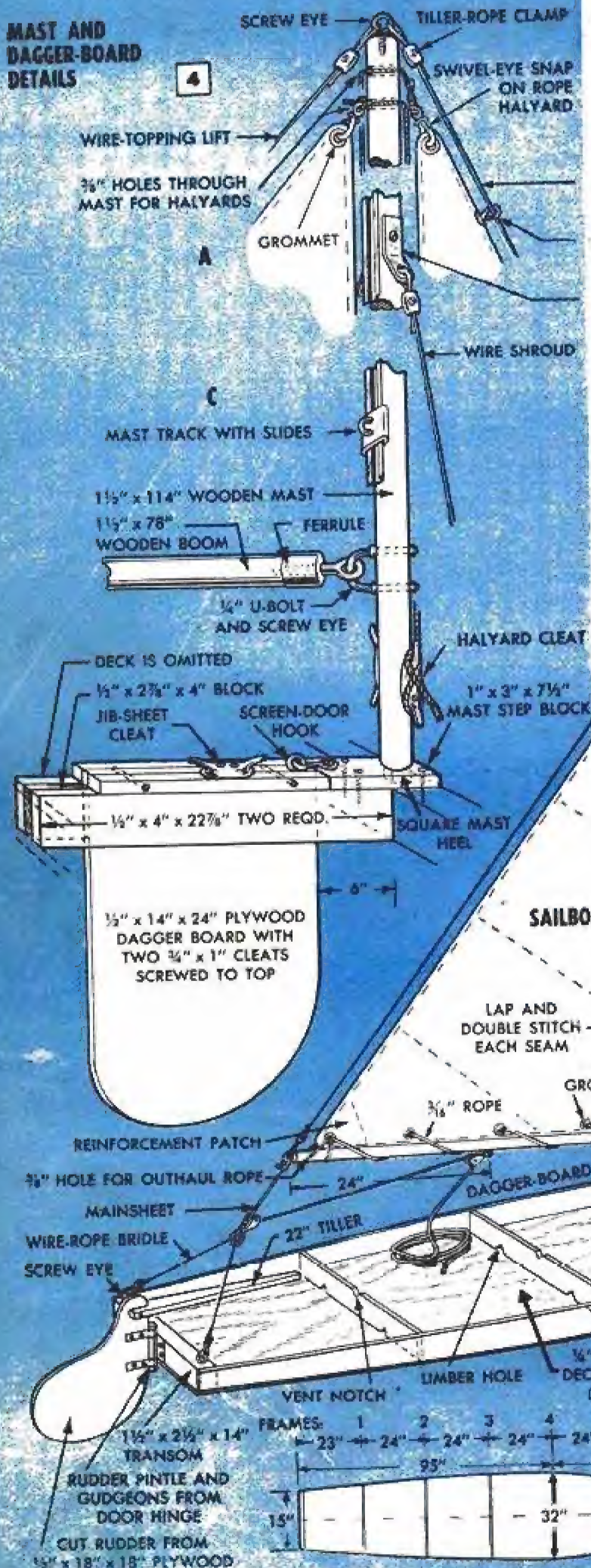
Surfboard construction details as shown above are intended to serve only as guide for making any length of board desired

Riders who cannot swim should wear adequate life jackets for their protection when dumped from board



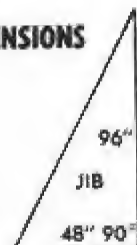
MAST AND DAGGER-BOARD DETAILS

4



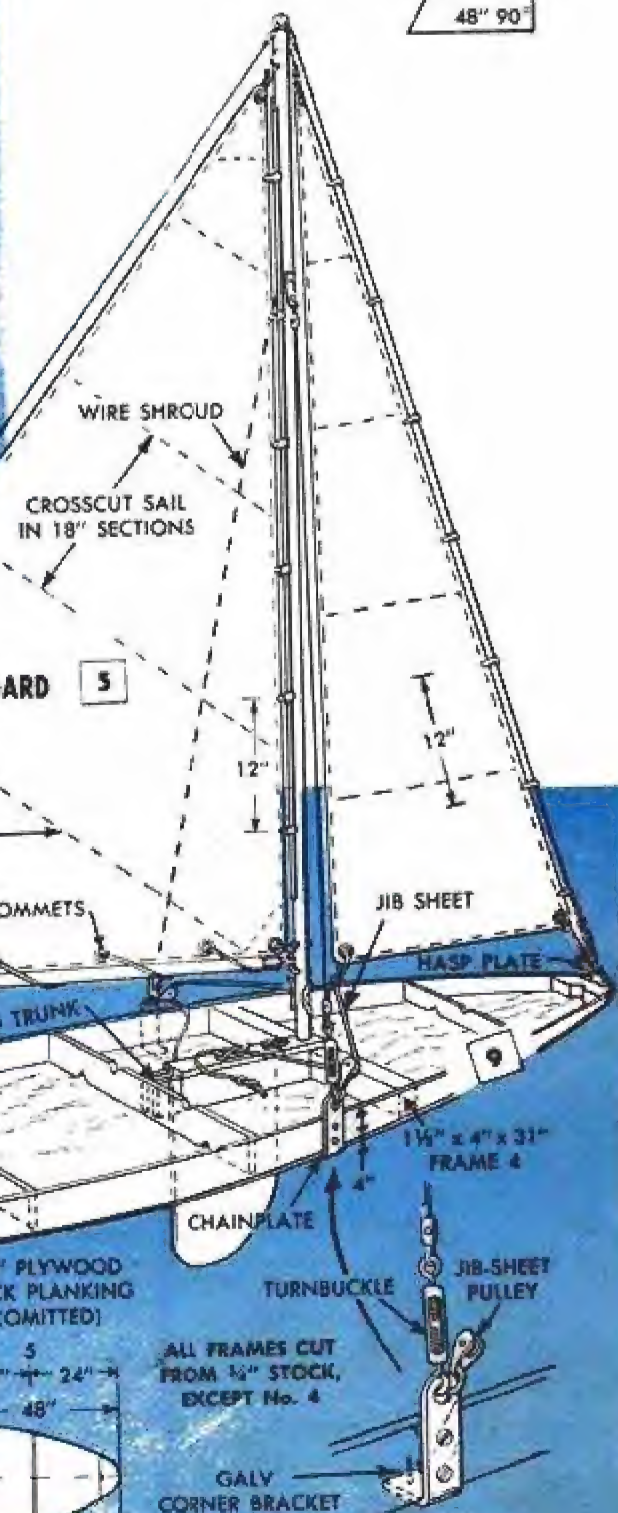
B

SAIL DIMENSIONS



SAILBOARD 5

5



directions for applying it. When doing this, a 4-in. overlap is left on each edge of the board.

Using a Surfboard

The trick of getting a surfboard under way on the face of a wave, is to paddle it seaward to a point where the waves appear to be on the verge of breaking. Having positioned yourself on the board at that point, paddle vigorously shoreward. As the wave steepens under the board and carries it forward, quickly rise to your feet on the board and guide it diagonally across the front of the moving wave by tilting it to left or right as required. The best riding location is just ahead of the crest of the wave, which is called riding the "hook." A "slide" of 100 yd. on one wave is considered good. To help keep your feet from slipping on the smooth board, rub the deck with paraffin when the board is still dry.

Paddleboards

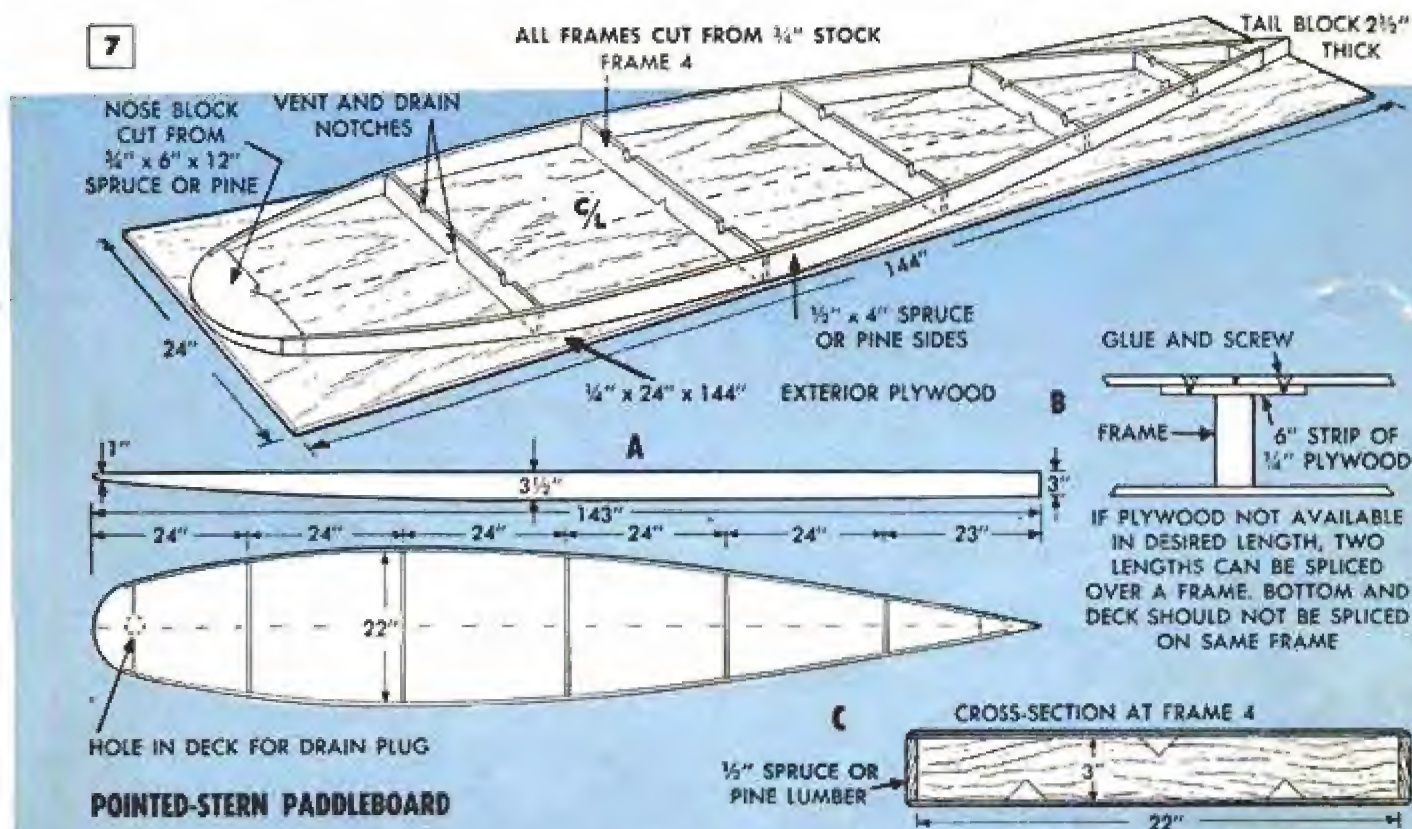
Both the pointed and square-stern paddleboards are easy to build. Construction details for making a 12-ft. pointed-stern paddleboard are given in Fig. 7. A 10-ft. square-stern board is shown in Fig. 8. Either board may be built in 8, 10 or 12-ft. lengths simply by adding or eliminating one or two frames in the stern section. An 8-ft. board will carry a maximum of 115 lb., a 10-ft. board any adult and a 12-ft. board will carry two adults.

Construction procedure is the same for both types of boards. Details A, B and C, Fig. 7, apply to both boards, except that

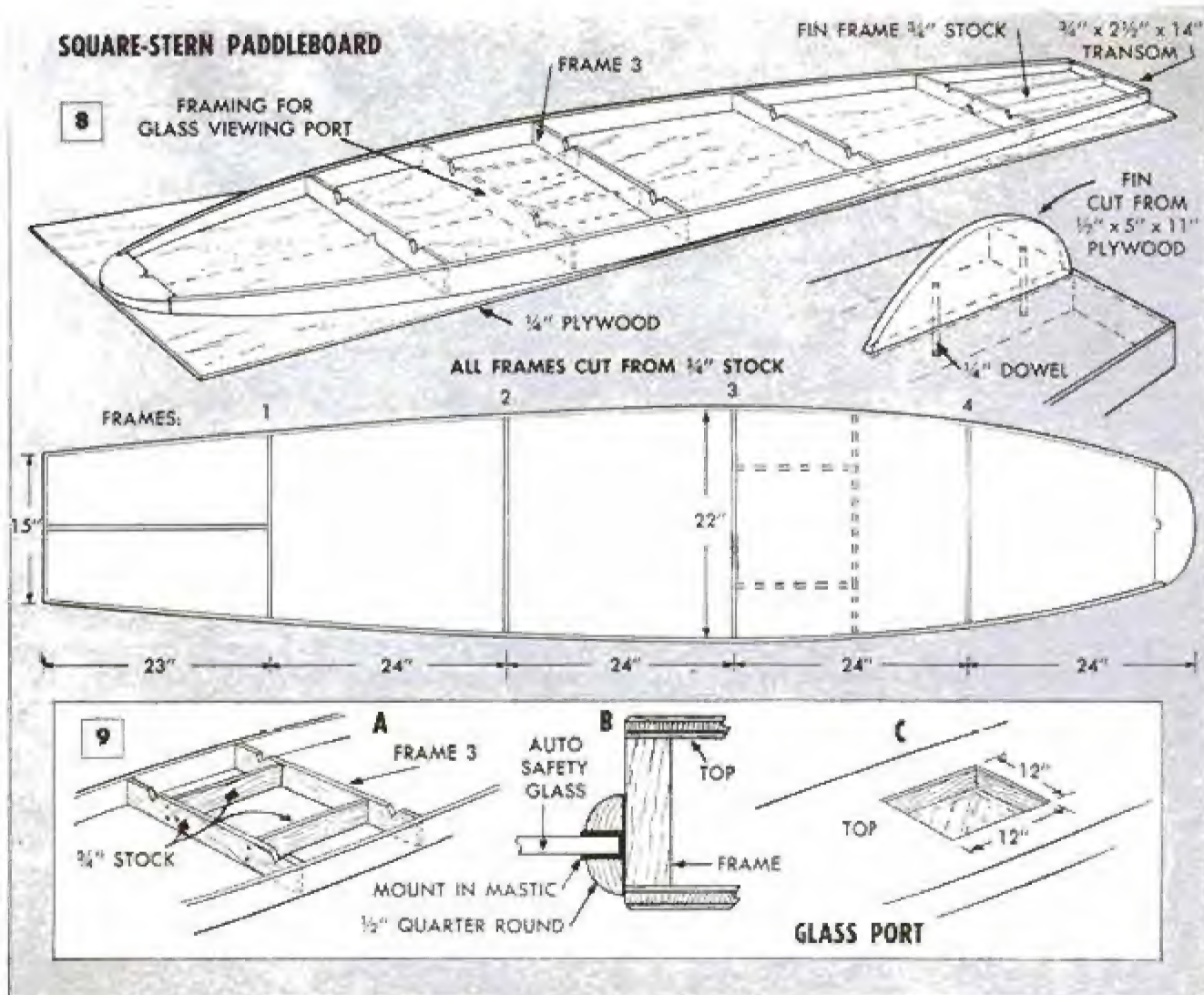


Portable electric sander makes an easy job of rough-shaping balsa blank from which surfboard is carved

the cross section at frame 4, detail C, occurs at frame 3 for the square-stern board. To make one of the boards, first place the panel of plywood that is to be used for the deck planking on a level surface and draw a centerline lengthwise on it for lining up the frames, Figs. 7 and 8. Next, cut the nose block, the frame that occurs at the point of maximum beam, and the tail block, or transom, to shape as required. Taper the nose block to $\frac{1}{2}$ in. thickness at its leading edge and notch it to receive the side planking. These three members are then glued and screwed to the plywood top. Both boards take the same size nose block that is positioned 1 in. back from the end of the deck planking so that the same length of plywood can be used for the bottom planking. Next, the side planking is cut to shape and sprung around frame



SQUARE-STERN PADDLEBOARD



3 or 4, depending upon the type of board being built, and temporarily clamped in place at the ends to provide an outline of the board and permit cutting the other frames to their correct lengths. When cutting the side planking, clamp both members together and use a long batten to determine the tapered sections from the dimensions given in detail A, Fig. 7. The remaining frames, side planking, fin frame (for the square-stern board) are then glued and screwed in place.

Note all frames have drain and vent notches. The plywood panel for the bottom planking is clamped in place, marked for cutting and then glued and screwed in position. All edges are well rounded with sandpaper, before covering the board with glass fiber or painting it. Both boards must be fitted with a drain plug as indicated in Fig. 7. The glass port may be installed on either board, if it is not to be used for surfboarding, Fig. 9.

Sailboard

The sailboard is simply a "king size" paddleboard with a sail attached. Construction details are the same as the square-stern paddleboard. The only changes are

the thicker frame 4 for supporting the mast, the daggerboard and well and the heavier transom to accommodate the rudder as shown in Fig. 5. Details of the sails and rigging are given in Fig. 4. No special marine hardware need be used. All parts may be obtained from a hardware store and used as is or modified to suit the purpose, such as the rudder pintle and gudgeons made from a door hinge, Fig. 5. The sails may be purchased, or made from sail cloth or preshrunk muslin as shown. When cloth wider than 18 in. is used, it should be lapped and sewed on 18-in. centers. The seams prevent the wind from stretching the sail out of shape. Mast and boom are cut from 1½-in. dowel stock. Galvanized-steel tiller rope ⅜ in. in diameter is used for jibstay, shrouds, topping lift and bridle. Ends of these members are secured to their respective fittings with tiller-rope clamps as shown.

Sailing the sailboard is easy. You simply lie flat on the deck and steer the craft with your feet as in the illustration at the beginning of this article. Other than the prone position that must be assumed when sailing the board, it is controlled in the same way as a small sail boat. ★ ★ ★

CHILD'S STORAGE CHEST

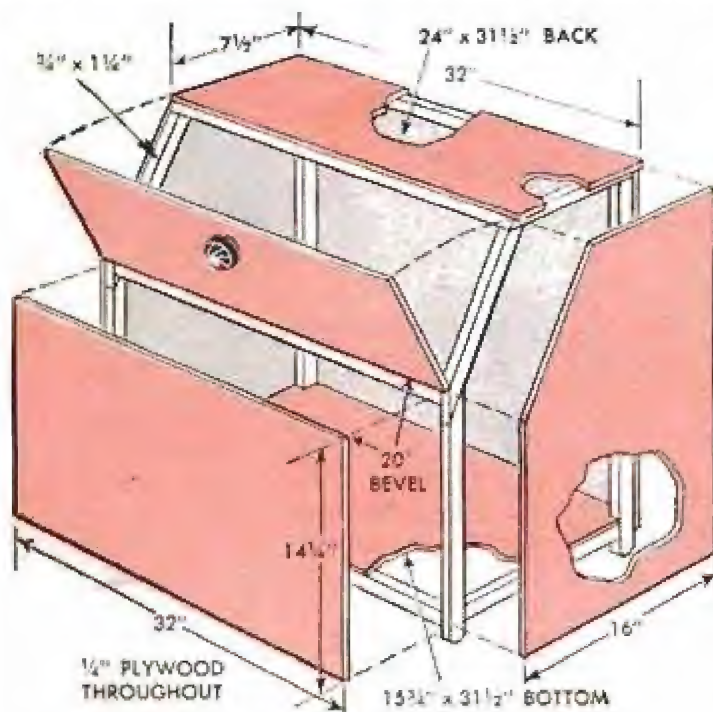
Here is a child's toy-and-storage chest designed for both present and future. When the child grows, the chest can be used for storing blankets and off-season clothing. The narrow top of the chest discourages climbing, being just big enough for a small bookshelf and a stuffed toy. To eliminate the hazard of a lid that could fall on small fingers, the lid is hinged to swing downward. It contacts the front of the chest only at one point, which is where the ball-shaped handle is located. This handle is a wooden sphere over which a hollow rubber ball is cemented, as indicated in the photo at right. The rubber covering prevents the handle from scarring the chest. A "skin" of plywood or hardboard $\frac{1}{4}$ -in. thick is glued and nailed to a framework assembled from 1 x 2 stock. Notice that the lower ends of the vertical members of the frame project to form "built in" legs for the chest. Using a piano-type hinge on the lid assures maximum strength and prevents it from warping or being pulled loose by over-enthusiastic playmates. The finished chest can be stained, painted, wall-papered or covered with self-adhering sheet plastic of a suitable pattern for a child. The book-case can be assembled from $\frac{3}{4}$ -in. pine stock.—Bob Johnson, Lakewood, N. J.



Happy little girl demonstrates how easy it is to grasp handle that is made as shown in photo below



Chest consists of frame work covered with plywood or hardboard. Lid is attached with piano-type hinge





Oil-Drum Barbecue Grill Serves Large Groups

Just the thing for large family picnics or other large-group outings, this barbecue grill is made easily from a 55-gal. steel oil drum split in half lengthwise with a cold chisel. Two steel angles are welded to each end for the legs. Threaded metal rods fitted with nuts are slipped through holes near the top edges of the drum to reinforce it. Two racks made of woven-wire fencing fastened to a welded frame of metal rods hold the meat to be cooked, the rod ends extending beyond the wire to provide four handles as indicated. A. M. Wettach, Mt. Pleasant, Iowa.

Square Rod Welded on Garden Rake Aids Preparing Lumpy Soil

For easy breaking-up of hard lumps of soil in the garden when preparing it for planting, one home gardener welded a length of $\frac{3}{8}$ -in. square rod on the back of a rake of the type shown in the detail. When lumpy soil is encountered, the rake is held in a vertical position and used as a tamping tool as illustrated. Also, the additional weight of the rod helps the teeth of the rake to penetrate loose material lying on the surface of the ground, requiring less effort when raking leaves or other debris.

Robert P. Nute, Cincinnati, Ohio.

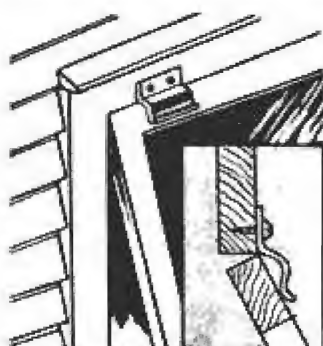


Lightning Rods for Shade Trees

Valuable shade trees can be protected from damage by lightning, when properly grounded lightning rods are installed on a few of the tallest ones. It is important to carefully follow the manufacturer's directions for best results, especially the placement and method of attaching the rod tips to the treetops.

Clamps for Storm Sash

Two sheet-metal clamps screwed to the top of a second-floor window frame as shown, permit removing and replacing screen and storm sash from within the house to eliminate the hazard of balancing the sash on a ladder. The clamps are cut from heavy-gauge galvanized sheet metal formed as indicated.—Bil Toman, Palatine, Ill.



Trisodium-Phosphate Solution Cleans Soiled Masonry

To remove grease spots from a brick or concrete porch, sidewalk or terrace, use a solution of $1\frac{1}{2}$ cups of trisodium phosphate mixed with 1 qt. of hot water. Brush the solution into the soiled areas with a stiff brush and flush it off with hot water. Repeat this procedure as many times as is necessary to clean thoroughly all soiled surfaces.—Charles Mathis, Wildwood-By-The-Sea, N. J.

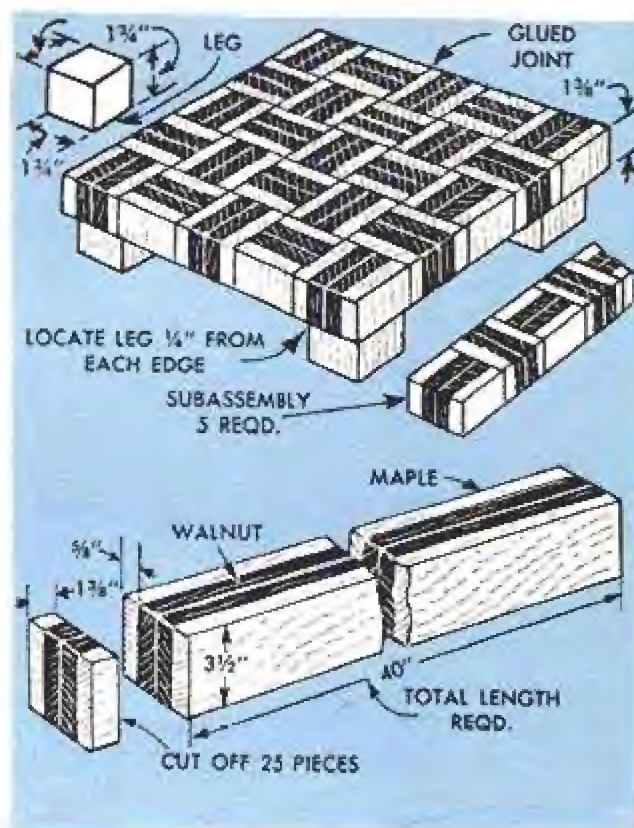
Laminated Chopping Block Doubles as Snack Tray



Here is a chopping block that will serve equally well as a kitchen utility block or as a decorative tray on which to serve snacks. If used for the latter purpose, the block is varnished. Otherwise, it is left in its natural finish and a coat of salad oil rubbed into the end grain.

To make the block, simply glue together two lengths of walnut and two lengths of maple lumber as shown in the drawing. Then, the uneven sides of this laminated stock are trimmed so that it is perfectly square and the entire length is cut into 25 squares, each of which is $1\frac{3}{8}$ in. thick. These squares then are arranged to produce a pattern of contrasting light and dark wood as shown, and all adjoining edges are glued. For an accurate and easy job of gluing, the squares should first be glued in five subassemblies of five squares each as in the detail.

After the subassemblies have been glued together, $1\frac{3}{4} \times 1\frac{3}{4} \times 1\frac{3}{4}$ -in. legs are glued on the underside of the block $\frac{1}{4}$ in. from each edge as shown. Waterproof glue and proper clamping should be used on all gluing operations for a good job.



To finish the chopping block, the top is sanded smooth and a $\frac{1}{4}$ -in. bevel is planed on the upper edges to prevent chipping or splintering of the ends. The top should be wiped with a damp cloth after each time the block is used and an occasional coat of salad oil rubbed in when the wood becomes dry. As an alternate finish for a chopping block only, use melted paraffin to treat the top. If the block is to be used for serving snacks or as a decorative piece, the wood should be given several coats of spar varnish in place of the oil. Shellac will keep the varnish from soaking in the end grain.

Howard P. Wurtz, Santa Barbara, Calif.

Aluminum-Covered Boathouse Floats on Steel Oil Drums

Floated on four steel oil drums, one at each corner, this boathouse measures 12 x 20 ft. Strips of aluminum roofing 2 ft. wide are used to cover the building, providing a highly weather-resistant exterior. Two

U-shaped brackets bent from flat steel are bolted to the shore side of the building. They fit over pilings, thus permitting the boathouse to rise and fall as the water level changes in the river.



Eight Types of Mortar Joints And How to Make Them

By W. B. Eagan

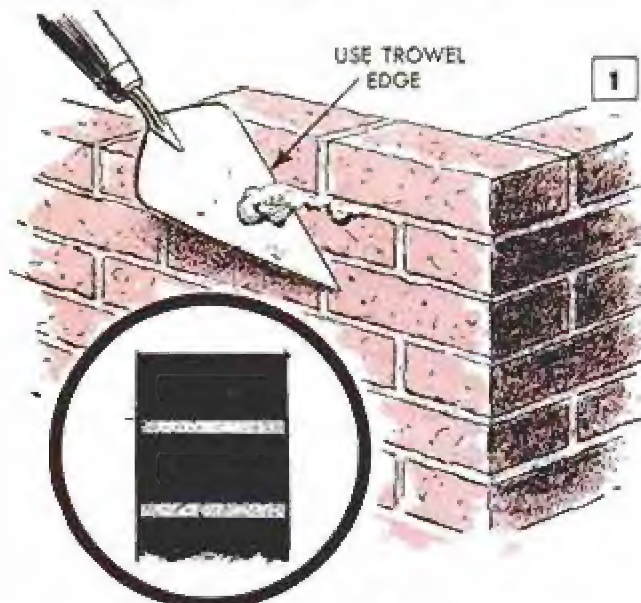


WHETHER YOU PLAN to build a brick-veneer garage or just a small planter box, it will pay to know how to finish the mortar joints in a way that not only will result in a pleasing appearance, but also produce a watertight surface on all exterior construction.

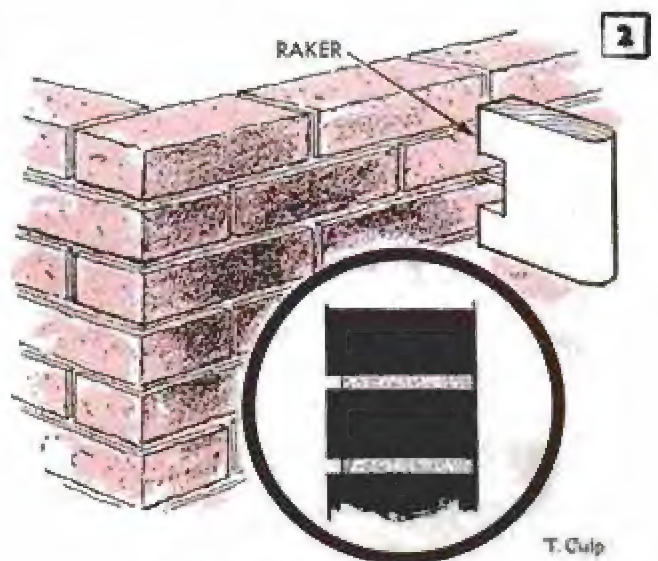
One of the quickest and most easily applied mortar joints is the "flush" joint, Fig. 1. You can apply a flush joint simply by cutting off the excess mortar from the vertical and horizontal joints with the edge of the trowel. No other operation is necessary. Although it is used extensively on interior work, the joint is not recommended for exterior construction. When making it, many voids and rough spots tend to remain on the surface of the material to readily

absorb moisture that may be transmitted to the interior of the wall.

"Raked" joints produce dark shadows that accent the pattern of the masonry, Fig. 2. To make this joint, the extruded mortar is first cut off flush with the brick, using a trowel. After a lapse of a few minutes, when the mortar begins to congeal, the mortar joint is raked out to the desired depth. The vertical joints are raked out first, followed by the horizontal ones. Professional tools, such as a steel raker or jointer can be used for tooling (finishing with a tool) this type of joint, but a raker made from a hardwood block with a nail driven in a notch cut in one edge of it, will work just as well as shown in Fig. 2. The depth to which the nail is



FLUSH JOINT



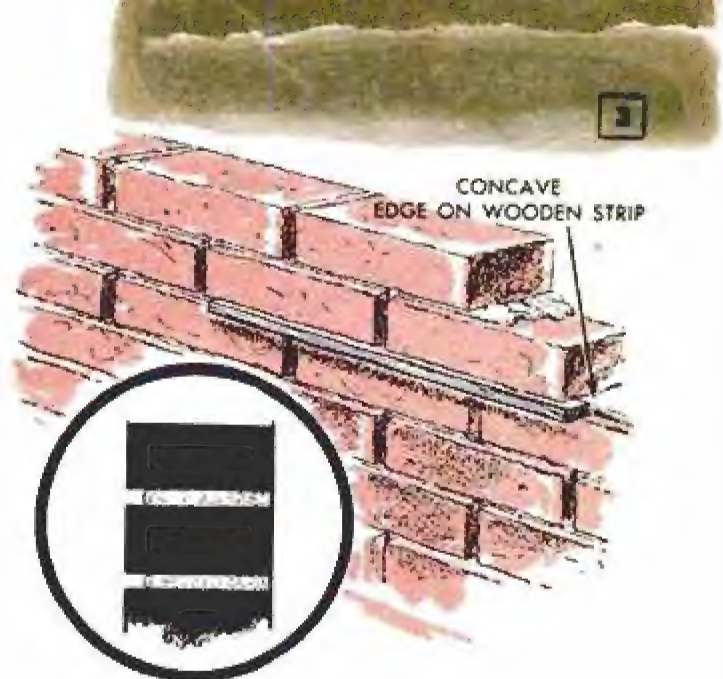
RAKED JOINT

T. Culp

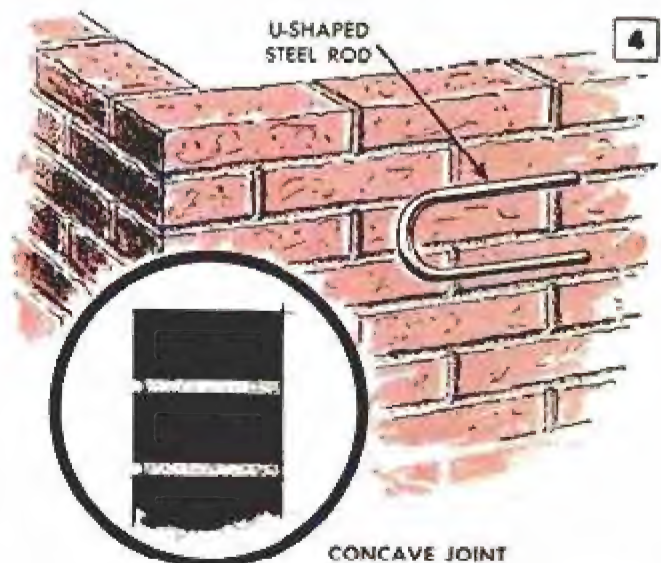
driven into the block determines the depth or recess of the mortar joint. To complete this type of joint, a square tool of the same width as that of the joint is run over the mortar to compress it and fill all voids. Another method of applying the raked joint is to force out the mortar before it congeals using a jointer tool having a square end. When the mortar is slightly congealed, the excess is removed from the outer surfaces of the brick with a stiff-bristled brush.

A type of joint that is difficult to make and which requires considerable preparation, is the "stripped" joint, that results in a convex-surfaced mortar joint, Fig. 3. When making the joint, a wooden strip with a concave surface cut on one side edge is placed flush with the outside edge of the preceding course of brick. The mortar is then placed on the brick for the full length of the strip and flush with the top of it and the next course of brick is laid. Only the ends of the brick are coated with mortar before positioning them on the work. When the mortar becomes slightly congealed, the strip is removed and the vertical joints are tooled with a raker.

A less dramatic-appearing joint than some of the others but the best from a standpoint of keeping out moisture and ease of application, is the "concave" joint shown in Fig. 4. This type of joint should be applied with sufficient force to press the mortar tight against the brick on both sides of the mortar joint using a cylindrical-surfaced tool that is slightly larger than the joint. Such tooling helps to seal cracks between the mortar and brick that may have been left when the extruded mortar was removed. Concave joints should always be used for face brick, unless the architecture requires some other type of finish. No other type of joint provides as much protection against entrance of water.

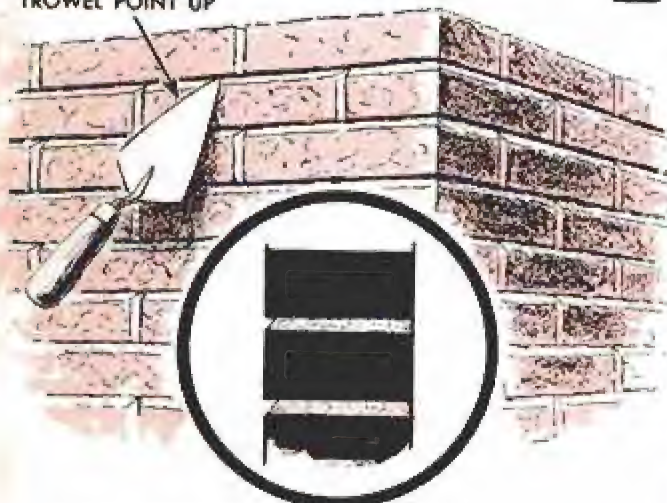


CONVEX JOINT



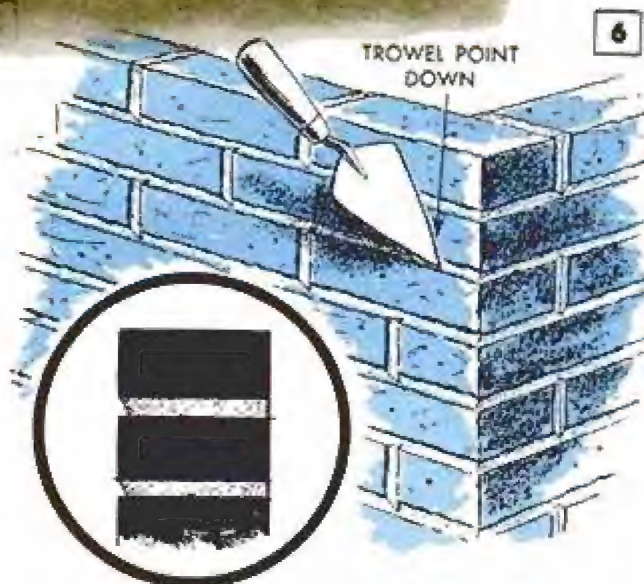
CONCAVE JOINT

TROWEL POINT UP

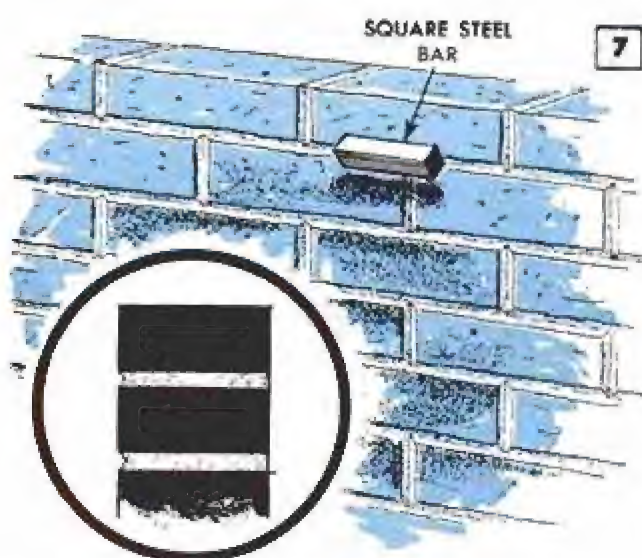


WEATHERED JOINT





STRUCK JOINT



V-JOINT



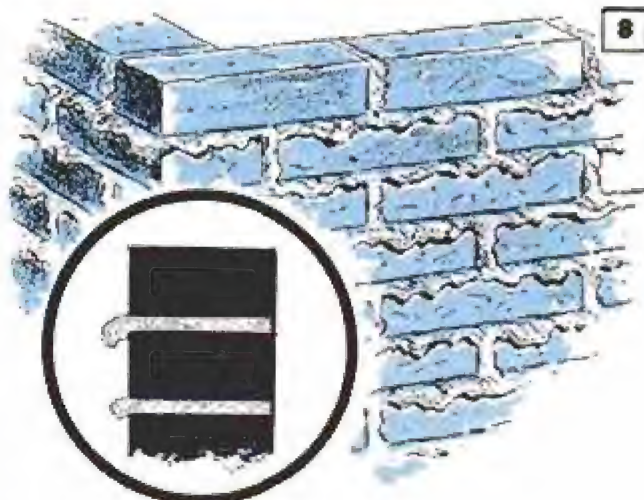
The "V"-joint is made in the same manner as the concave joint, except that a short length of $\frac{1}{2}$ -in. square steel bar or an appropriate jointer tool is used for surfacing the mortar joint instead of a cylindrical-shaped one as in the case of the concave joint, Fig. 7. When doing this, the tool is held in the position indicated and drawn along the horizontal and vertical mortar joints. If you want to accent the horizontal mortar lines, do them last. If the vertical lines are to be accented, do them last.

When making a "struck" joint, the mortar is permitted to congeal for a few minutes, after which the point of the trowel is quickly drawn along the joint. The trowel must be held at a sharp angle when doing this so that only the point comes in contact with the soft mortar as in Fig. 6. The vertical joints are made first, followed by the horizontal ones for neater joints. An undesirable aspect of a struck joint is that a shelf is left to collect water.

For some types of construction, an interesting play of light and shadow can be effected on a walled surface through application of the "weathered" joint, Fig. 5. This joint is made in the same manner as the struck joint, except that the point of the trowel is reversed so that it forces mortar in at the top of the joint, leaving a slight overhang on the lower edge of each brick course. When making this joint, care must be taken to pack mortar solidly against the top brick of the joint to obtain a good bond.

For good results, never change the position of brick once the mortar has begun to set.

The easiest joint of all to make, is the "extruded" joint as shown in Fig. 8. The mortar that is forced out as the bricks are laid, is not trimmed off but is simply left to harden in its extruded form. For exterior use, raked and extruded joints are best suited to a dry climate since the ledges formed by them tend to hold rain, snow, or ice that may enter voids in the mortar and cause the wall to leak. ★ ★ ★



EXTRUDED JOINT

"Running Gear" Makes House Fan Portable for Outdoor Use

There will be no smoke from the barbecue in anyone's eyes, and mosquitoes will have to be strong fliers to get close to guests in your back yard if a big cooling fan is used. The fan is the large type used to cool a whole house, and ordinarily not considered portable. Attaching a simple "running gear" to the bottom of the fan, as indicated, makes it completely portable. Two wagon wheels and an axle are fitted to two notched wooden members bolted to the fan. Leveling devices on the opposite ends of the members are doorstops. —Ed Packer, Pompano Beach, Fla.



Enlarger Adapter for Printing Smaller Negatives From Black Paper

If you have only occasional need to print small negatives in an enlarger designed for a larger size, there is no need to buy a special film holder. Instead, use a black-paper mount of the type used for color transparencies. When none of these are available, fold a piece of black paper and cut an opening in it slightly smaller than the size of the negative. After taping the negative between the folded layers of paper over the cutout openings as shown at the right, trim the improvised holder to fit the film carrier in the enlarger.

Virginia Hanson, Venice, Calif.



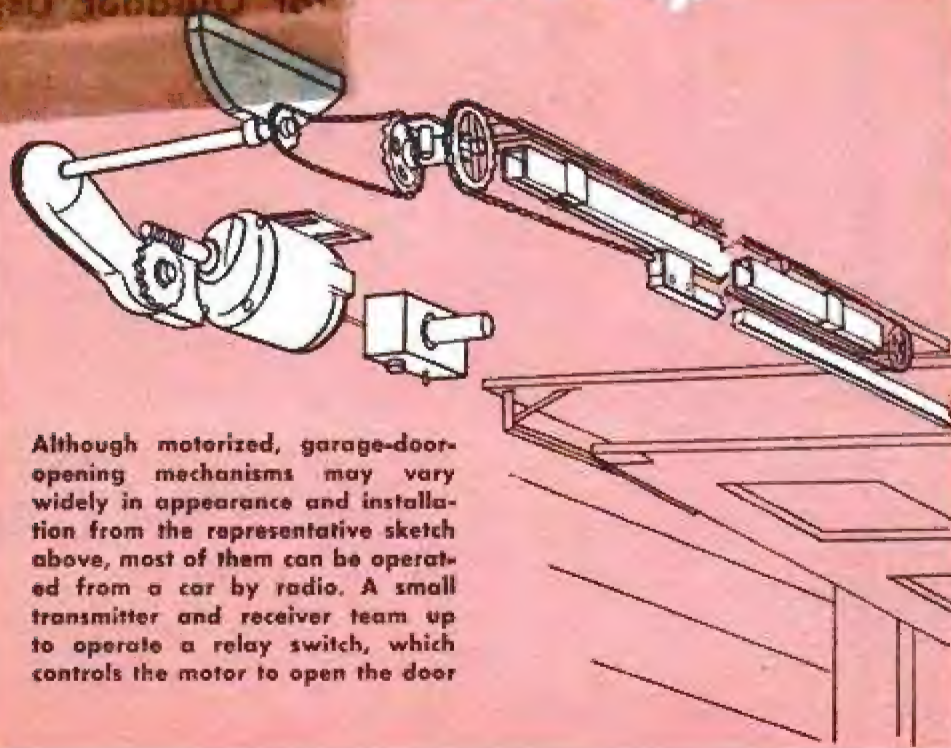
Photo-Equipment Bag Held Rigid By Inserting Cardboard Liner

To prevent photo-equipment bags made of canvas or soft leather from collapsing when emptied, fit them with a cardboard insert as indicated. Items of equipment then can be removed and replaced in the bag easily. By making the insert smaller than the bag, as shown, spaces are left at each end that can be used for separate storage of supplies and equipment not frequently needed. Size of the insert depends upon the equipment.

Richard Hanscom, Elmhurst, Ill.



☛When airing clothes, hang them on a piece of chain instead of a rope, and it will be possible to space the hangers as far apart as necessary without having them slide together. —I. M. Fenn, Chicago.



Although motorized, garage-door-opening mechanisms may vary widely in appearance and installation from the representative sketch above, most of them can be operated from a car by radio. A small transmitter and receiver team up to operate a relay switch, which controls the motor to open the door



Radio-Controlled GARAGE DOORS

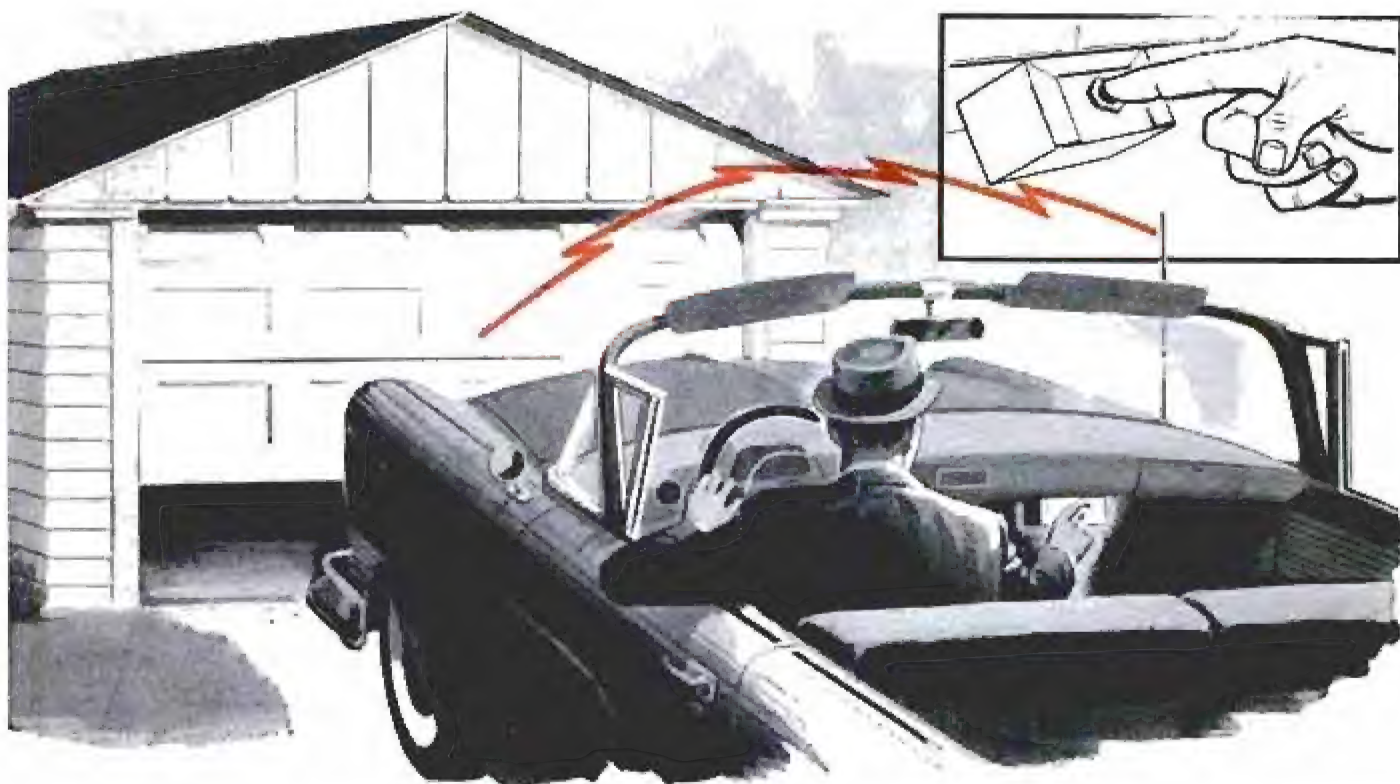
IF YOUR GARAGE DOOR is opened and closed by an electrically powered unit that is controlled by manually operated switches, such as the unit described in the July 1955 issue of *Popular Mechanics*, or by a commercial type similarly controlled, you can operate the unit from your car.

A small radio receiver inside the garage and a small transmitter inside the car do the job. Pressing a momentary-contact switch on the transmitter sends a signal to the receiver. The latter, in turn, operates a relay switch through which current to the door-operating motor is wired. The receiver and transmitter operate on the citizens' band, authorized for just such purposes. As it radiates only milliwatts of power, and has a limited range, you need not fear any interference problems. To keep it on its assigned frequency, the transmitter is crystal controlled. Both units are compact, their small size resulting from the use of transistors. An added advantage of the transistors is that they require very little power. Those in the receiver operate on two $1\frac{1}{2}$ -volt dry cells, and those in the transmitter operate on either 6 or 12 volts supplied by the car battery.

The construction of this radio-control system is intended only for hobbyists and experimenters having previous experience in radio work. Since no pictorial wiring diagrams are provided, it will be necessary to work directly from the schematics, although the photographs show the approximate parts placement.

Both the receiver and transmitter are built into small aluminum utility boxes, which easily house the necessary parts. Metal brackets are used as subchassis for mounting the transistor and crystal sockets in the transmitter and for the transistor sockets in the receiver, as shown. Only one part of the aluminum box should be used to house all parts and wiring. The other part serves as a cover which can then be installed and removed without disturbing the wiring.

In building both units, the transistors should be inserted in their sockets only after all wiring has been completed and thoroughly checked against the schematics. It is essential that the transistor leads are inserted in the correct socket holes to prevent damaging these units due to the application of reversed battery polarity to the transistor elements.



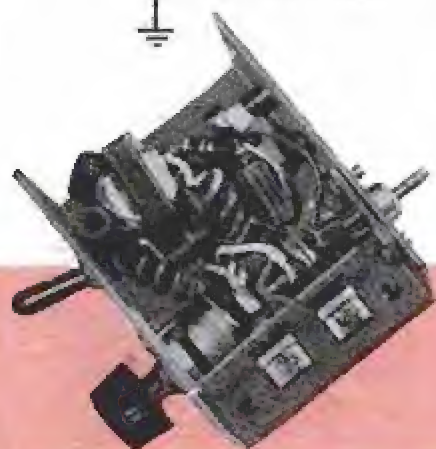
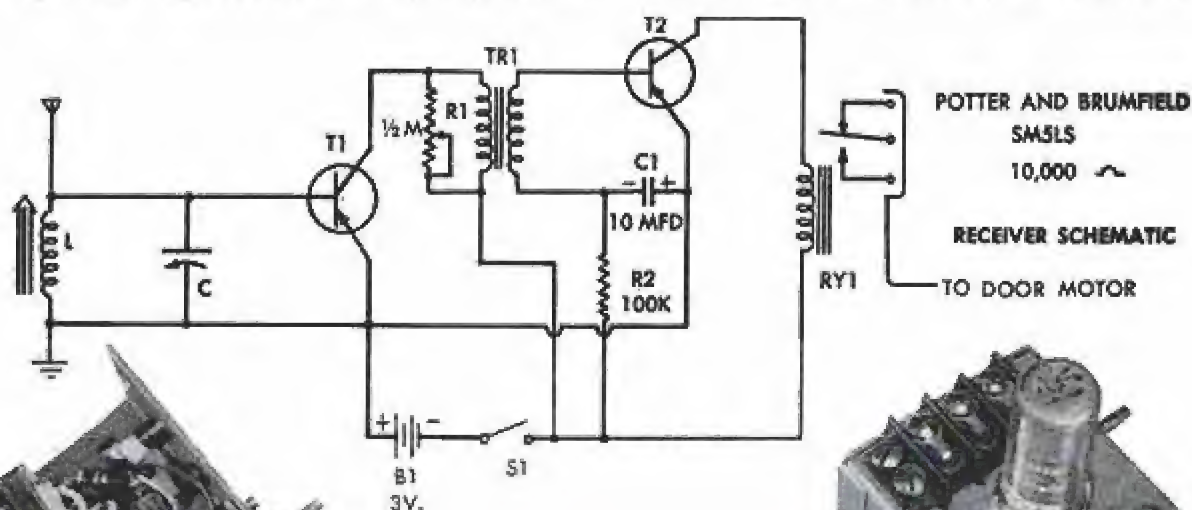
The 7-pin miniature tube socket for the control relay of the receiver and two barrier strips are mounted on top of the receiver chassis. The latter provide necessary tie points for connecting the externally placed dry cells as well as the wires from the door motor to the relay contacts. Mounted on the front panel are the potentiometer R1 and the on-off switch S1. The coil, L, is mounted on the rear panel of the chassis with the adjustment slug protruding through the back. A phono jack, mounted directly below the coil on the back panel, receives the pin plug at-

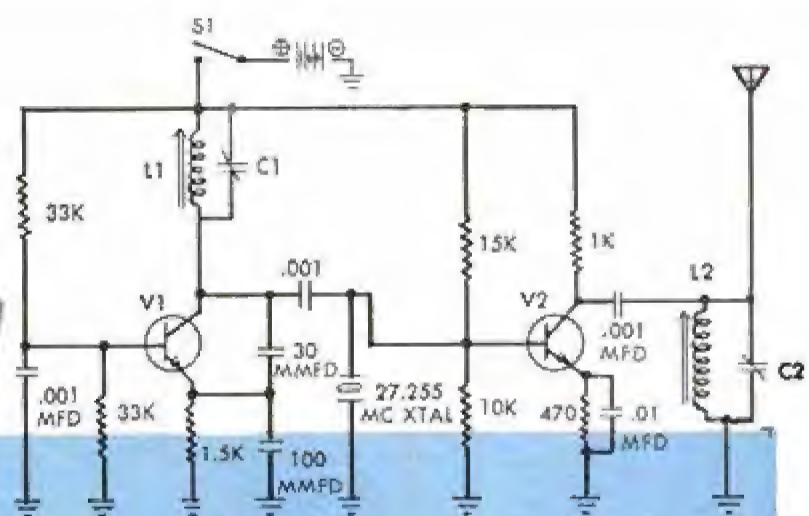
tached to the ends of the receiving antenna lead-in. The ceramic trimmer capacitor, C, is also fastened to the rear panel between two insulated stand-offs and this unit may be adjusted from the outside through a hole drilled into the panel at the location of the adjustment screw.

Wiring is noncritical, but all connections must be securely soldered with rosin-core solder if satisfactory results are to be obtained from the unit.

The Transmitter

The transmitter parts are so placed that





TRANSMITTER SCHEMATIC

the momentary-contact switch, S1, is mounted on the front panel of the chassis when the unit is installed on the automobile dash. The antenna, phono jack and a feed-through binding post, to which the

"hot" battery lead will be attached, are mounted on the rear. The binding post must be carefully insulated from the chassis with fiber washers to prevent short-circuiting the car battery. All small parts

PARTS LIST

TRANSMITTER

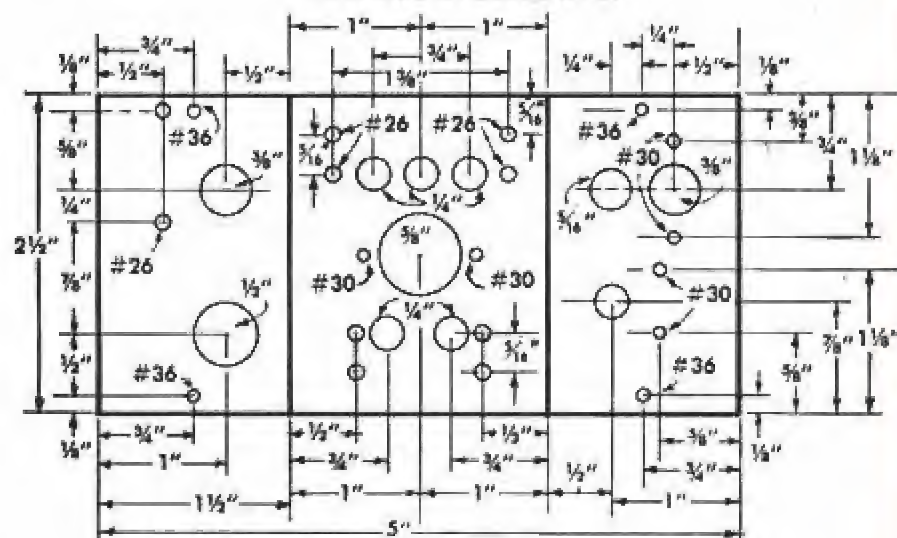
- TRANSMITTER**
 1 Chassis box, I.C.A. Flexi-mount No. 29335
 1 Phono plug and socket
 1 Crystal socket, Millen No. 33302
 2 Transistor sockets, Clinch-Jones No. 2H3
 2 Transistors, Texas Instr. Co. No. 2N248
 2 ARC mounting boards, Aircraft Radio Corp. No. 12855
 2 1-in. brass standoffs
 1 Momentary-contact switch, Miniature Switch Co., Oceanside Ave., Oceanside, N. Y.
 L1 and L2 Cambridge Thermionics Corp., LS 3-30 30-megacycle coil
 C1 and C2 3-30 ceramic trimmers
 2 .001 mfd. disk ceramic capacitors
 1 .01 mfd. disk ceramic capacitor
 1 30 mmfd. silver mica capacitor
 1 .001 mfd. silver mica capacitor
 1 100 mmfd. silver mica capacitor
 2 33,000-ohm, 1/2-watt resistors
 1 1500-ohm, 1/2-watt resistor
 1 15,000-ohm, 1/2-watt resistor
 1 10,000-ohm, 1/2-watt resistor

- 1 1,000-ohm, 1/2-watt resistor
1 470-ohm, 1/2-watt resistor
1 Crystal, International Crystals Co. No. FA-5
27.255 mc.

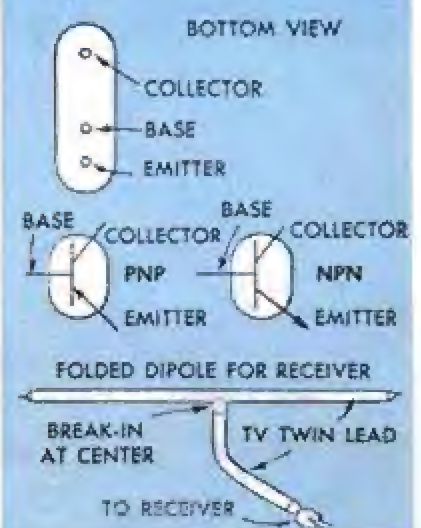
RECEIVER

- ### RECEIVER
- 1 C.T.C. No. LS3-30 30-megacycle coil
 - 1 3-30 ceramic trimmer
 - 2 Cinch-Jones No. 2H3 transistor sockets
 - 1 Phono plug and jack
 - 1 S.p.s.t. toggle switch
 - 1 Thoradson transformer No. TR-5 miniature, pri. 490 ohms CT—sec. 150 ohms CT (centertaps not used)
 - 1 10 mfd. electrolytic capacitor
 - 1 100,000-ohm, 1/2-watt resistor
 - 1 .5-megohm miniature potentiometer
 - 1 Potter and Brumfield relay No. SM5LS, 10,000-ohm coil
 - 1 7-pin miniature-tube socket
 - 2 Texas Instr. Co. transistors, No. 200A
 - 1 I.C.A. chassis box, Flexi-mount No. 29335
 - 1 Cinch-Jones 3-terminal barrier strip, No. 3-140
 - 1 Cinch-Jones 2-terminal barrier strip, No. 2-140

RECEIVER UNIT DRILL LAYOUT



GENERAL TRANSISTOR INFORMATION



such as resistors and capacitors may be mounted on fiber mounting boards placed underneath the sub-chassis housing the transistor and crystal sockets, with flexible wire leads connecting the two sub-assemblies. Holes should be drilled in the main chassis to permit external adjustment of the trimmer capacitors.

Ground Connections

The original unit, as shown in the schematic, was designed to be used with an automobile battery having the negative terminal grounded. In this case, the momentary contact switch is wired to the binding post which must be connected to the positive side of the car battery. All circuit-ground connections are made directly to the metal box which, when fastened to the dash, provides the ground-return for the transmitter circuitry. If your car has the positive side of the battery grounded, the connections indicated as ground on the schematic are not fastened to the chassis but are connected to the binding post instead. One terminal of the switch, instead of going to the binding post, is wired to the chassis. The binding post is then connected to the negative side of the car battery.

Antennas

For best results, the antenna used for the transmitter should be an 8-ft. vertical whip fastened to the car. It is quite conceivable, however, that an automobile antenna will provide satisfactory results because of the small signal required to operate the receiver from a relatively short distance. The receiving antenna in the garage should, ideally, be identical to the transmitting unit, but a very satisfactory receiving antenna can be made from ordinary TV lead-in, cut to a length of 8 ft., as shown

in the lower right-hand detail on page 182.

In the absence of a grid-dip meter or similar test instrument, the system can be adjusted as follows:

1. Place the receiving antenna within a foot or so from the transmitting antenna, adjust the potentiometer in the receiver so that maximum resistance appears across the primary transformer winding and apply power to both units.

2. Adjust the slugs in transmitter coils L1 and L2 and their screws on the associated trimmers C1 and C2 until a soft click in the receiver relay indicates that the relay contacts have closed.

3. Slowly rotate the potentiometer in the receiver until the relay contacts open, and carefully readjust C1 and C2 until they, again, close. Continue this procedure until optimum adjustment is obtained.

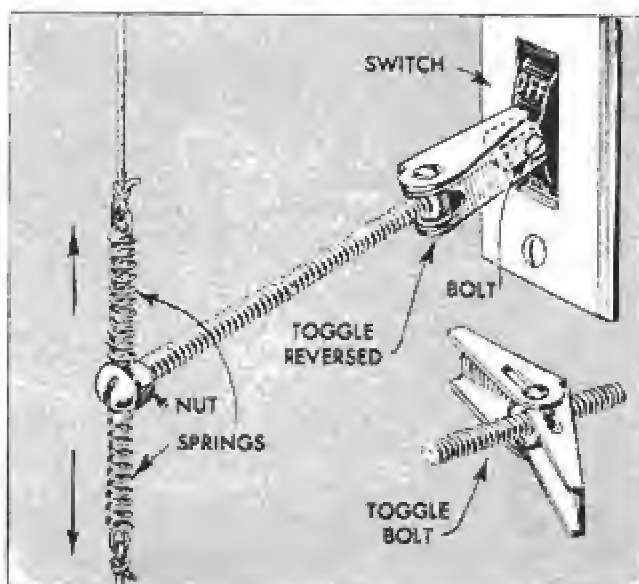
4. Now adjust the receiver coil and trimmer in the same fashion until you have reached the setting which permits the relay to close with the smallest amount of resistance shunting the primary transformer winding. Then, reset the potentiometer for maximum resistance and leave it there.

Receiver Installation

To install the receiver it is merely necessary to connect the normally open relay contacts to one of the manually operated switches on your door-opening unit. To make this connection, run a wire from the center arm of the relay to one side of the manually operated switch. Run another wire from the normally open relay contact to the other side of the switch. This hookup merely bypasses the manually operated switch so that the receiver controls the door-opening motor through the relay. You can still operate the door with the manually operated switch, if desired.—Byron G. Wels, 6 Timber Lane, Levittown, N. Y.

Toggle Bolt Provides Extension For Modified Wall Switch

Adding an extension to an ordinary wall switch will permit it to be used with a garage-door opener, or with a float-type, liquid-level control. The extension consists of a toggle bolt, the toggle portion being reversed and fitted over the switch lever as indicated. A hole is drilled through the ends of the toggle and the switch lever, and a small screw and nut are used to clamp the toggle on the lever. Arrangements can be made to hook up the modified switch to a garage-door opener or liquid-level control, but it is suggested that springs be incorporated to minimize strain on the switch lever.—Hugh Lineback, Stillwater, Okla.



Flagstaff Topped With Sphere Made From Hollow Rubber Ball

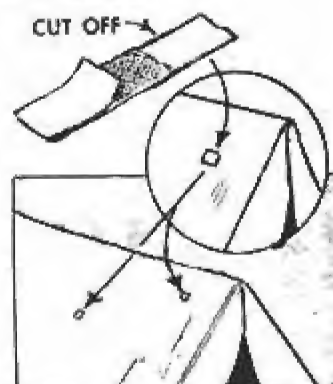


Add a neat, finishing touch to a home-made flagstaff by fitting the end with a sphere made by cutting a hole in a hollow rubber ball. The ball is attached to the staff with a screw, as in the detail, then painted with silver or bronze paint.

G. E. Hendrickson, Argyle, Wis.

On-The-Spot Tent Patch

If a pinhole develops in your tent while on a camping trip, cut a piece from the end of a waterproof plastic finger bandage and stick it over the hole. This patch will last until a permanent one is made.



Quick Air-Mattress Inflation With Air From Spare Tire

To eliminate the need for pumping up air mattresses every evening on a camping trip with a hand pump, or by lung power, one man fitted suitable attachments to a length of hose and used his spare tire as a compressed-air source. The spare was inflated next morning at the nearest service station. Carrying a couple of extra, inflated inner tubes would eliminate the problem of having an airless spare tire, if it were needed. The tubes could be used to cushion luggage in the car trunk. A wrapping of cord will confine tube size.

Arnold M. Maahs, Tilleda, Wis.

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HAND HONING

has many shop uses

By Walter E. Burton



IN SMALL-SHOP PRACTICE, honing is simply the final step in either sharpening or dressing a cutting edge or finishing metal to a smooth surface before polishing or lapping. In metal finishing, honing has numerous applications where fit and appearance requirements do not call for the final operations of lapping or polishing. In present-day practice, both in sharpening a cutting edge and in finishing metals, hand honing is usually done with very fine abrasive stones which are available in a variety of sizes and shapes, grit sizes and degrees of hardness, Fig. 2. Not all of the abrasive stones pictured in Fig. 2 classify as hones, of course, as some are comparatively fast cutting and some are the combination type having one side coarse, the other fine. In sharpening a cutting edge, the main purpose of honing is to remove any roughness left from preceding operations done with stones of coarse and medium-grit sizes. The end result of the three-step procedure is a very smooth, keen cutting edge.

The bench stones, Fig. 2, commonly

known as oilstones, generally are used in a fixed position, the work being moved over the surface of the stone in one of several uniform stroke patterns, back and forth, an overlapping circular movement, or a figure-eight stroke. When using the sticks, slips and hones, the work usually is held stationary and the abrasive is moved over the surface of the work or along the cutting edge. A handy variation of the abrasive stick is the engraver's pencil. It has practical applications other than the special purpose for which it was designed. For example, it's useful for finishing hard-to-reach areas of small parts such as jewel mountings, Fig. 1, and in instrument and model assembly where it is necessary to produce a bright finish without undue removal of material. Fig. 4 pictures another example where a small part is held in a collet chuck and hand finished with the engraver's pencil. A similar operation, using a slip, is being carried out in Fig. 3.

Figs. 8 and 9 picture important steps in sharpening a wood chisel. If the cutting

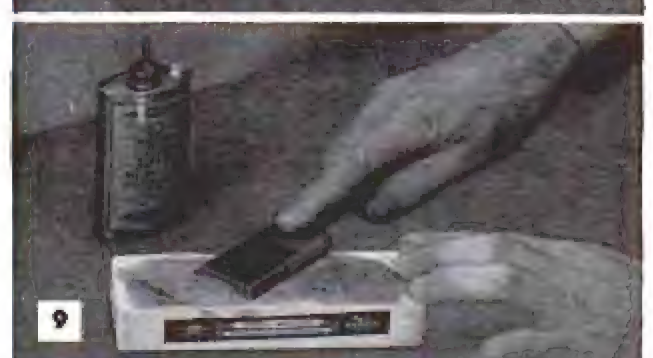
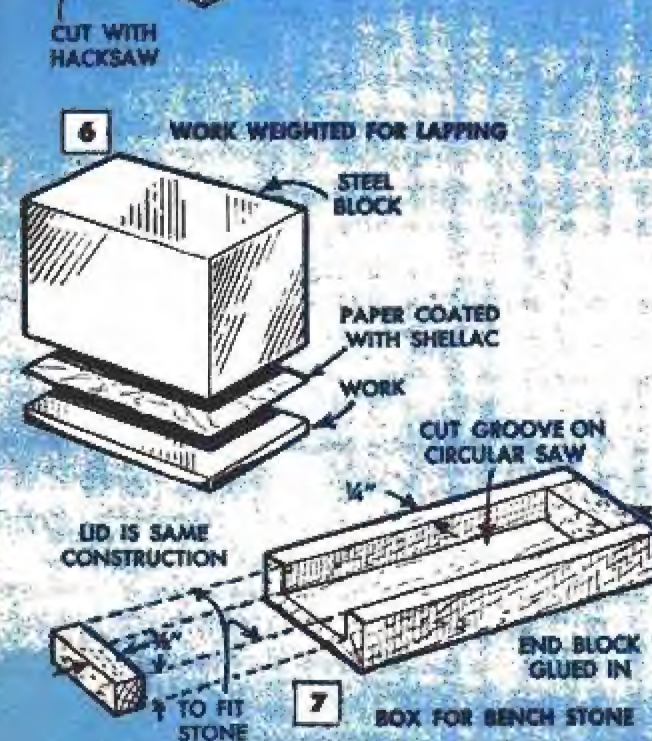
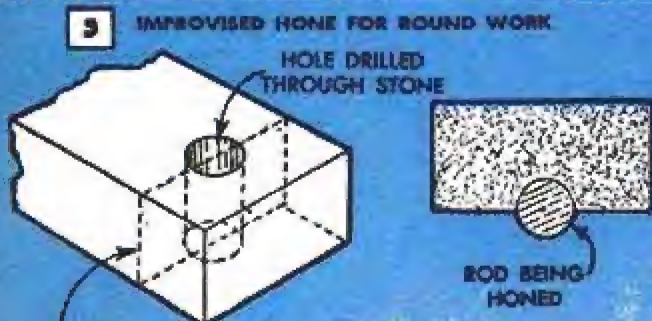




edge is very dull and nicked, rough grinding must be done to reshape the bevel and remove any nicks before the step pictured in Fig. 8 is carried out. Note in Fig. 8 that the blade is held with the bevel flat on the surface of the stone and also that it is held at a slight angle with the stone. This position gives better control as the sharpening strokes are made. The left hand applies pressure which should always be light. As this step proceeds to the point where grinding marks are removed from the bevel it will produce a wire edge, that is, metal at the extreme edge will be reduced in thickness to the point where it bends away from the surface of the stone. At this point the blade will cut fairly well but will not retain its edge for a normal time unless the wire is removed. This is done by inverting the blade, placing it flat on the stone and stroking very lightly.

To produce a very fine, keen-cutting edge, careful craftsmen go one step farther and dress the edge on a hard oilstone or slip. When doing this they place the bevel flat on the stone, then raise the blade very slightly so that the heel of the bevel clears the abrasive surface. Light stroking with the blade held in this position not only produces a razor-keen cutting edge, it also forms a narrow second bevel just back of the cutting edge to give added support. In all these sharpening operations, with the exception of rough grinding, a light oil should be used on the stone to float away the fine particles of metal removed in the sharpening and honing steps.

After rough-grinding the outside bevel on a gouge, carvers often finish the edge on a round-edge slip as in Fig. 10. Although in this case the slip is shown being held stationary in a vise, some craftsmen will





For a fine edge on a pocket-knife blade use a hard abrasive stick. Unless the edge is nicked or otherwise damaged, honing with the stick will suffice

prefer to use the slip freehand, holding the tool stationary rather than the slip.

Some jobs may require improvised methods, Figs. 5 and 6 being examples of special applications. For polishing rods and shafting drill a hole of the same diameter as the rod or shaft through an old oilstone, cut through with a hacksaw as in Fig. 5 and you have a handy hone for the job. In some instances it may be an advantage to weight the work uniformly rather than depend on finger pressure as in Fig. 12. This can be done as in Fig. 6, using a steel block to which the work is attached. This procedure, which is a form of lapping, utilizes a fine oilstone having a true surface.

To protect a fine, hard oilstone of the type shown in Figs. 8 and 9, which is ordinarily used at the bench, make a box, or holder, from hardwood as in Fig. 7. A few drops of glue will serve to hold the stone in the lower half of the box. Figs. 11, 13 and 14 are examples of hand operations where the work is held stationary and the abrasive is moved over the surface. For finishing a pocketknife blade to a keen edge, Fig. 11, cleaning up a worn lathe chuck, Fig. 13, or squaring the edge of a scraper blade, Fig. 14, these methods usually are satisfactory.

Keep the stone clean by wiping off any excess oil after using. It's a good idea also

If you drop a stone and break it, the broken parts are still useful. Here a section of a broken stone is being used to clean and polish a worn lathe chuck



Honing, or lapping, small gear wheels on a round bench stone removes burrs, dents or other imperfections and produces a fine finish. Use light oil on stone

TYPES OF OILSTONES USED IN HONING

Hone*	Material	Can Be Used to Hone**
		Knives and other edged tools
Silicon Carbide		Woodsmen's edged equipment Iron castings Aluminum and brass parts Carbide tools
Aluminum Oxide		Woodworking and other shop tools High-speed-steel lathe bits Alloy-steel punches, dies, etc. Scissors Knives
Novaculite		Carving tools Razors Watch and clock parts Parts of models Gun-mechanism parts Workshop tools Carving tools Pocket knives Woodworking tools Leather-cutting knives Miscellaneous tools

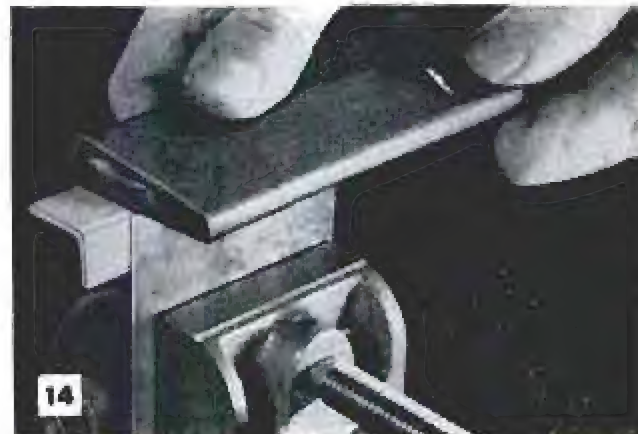
Some of the above materials are made into honing wheels which are rotated in a jeweler's lathe or by other means at speeds considerably slower than for a grinding wheel of same size.

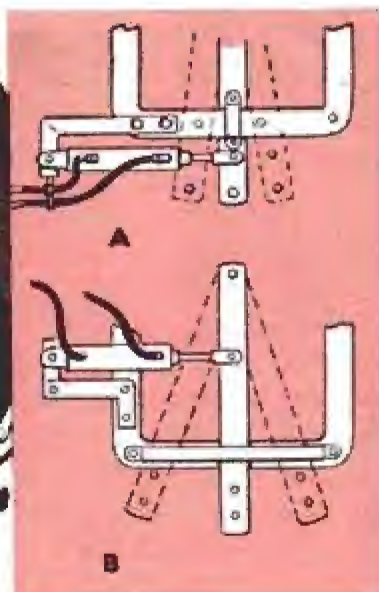
*The word "hone" is understood to mean here an abrasive stone called variously by such names as oilstone, sharpening stone and whetstone.

**Differences between the ability of various stones to hone different kinds of metals are not sharply drawn and, in general, it is possible to hone almost anything on any stone—allowing for variations in speed, finish, economy, etc.

to wipe the abrasive surfaces occasionally with a soft cloth dipped in solvent. Keep the stone in a bench drawer where it is less likely to fall accidentally to the floor and be chipped or broken. ★ ★ ★

A trick in squaring a scraper blade with a slip is to hold a short length of aluminum angle as shown. This slides along side of blade and acts as a guide





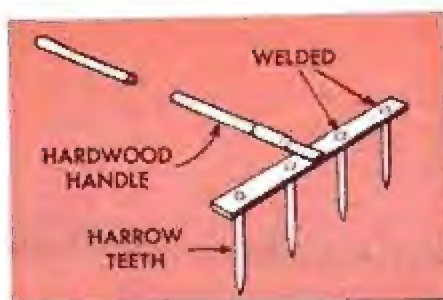
Hydraulic Cylinder On Drawbar

Controlled from the seat, this hydraulic cylinder linked to the drawbar permits easier, quicker alignment when coupling the drawbar to farm implements and provides accurate steering when making sharp turns while towing implements. The cylinder is bolted to a metal bracket which can be fitted in one of two ways as shown.—C. F. Marley, Nokomis, Ill.



Barbed-Wire Fencing Strung With Tractor-Mounted Reel

Stringing barbed wire for fences is a fast and simple job when this tractor-mounted wire "unwinder" is used. Lengths of steel angle are welded to form a U-shaped platform, the floor of which is a piece of steel plate. A steel rod welded to the plate acts as a spindle on which the roll of wire rotates. The end of the wire is fastened securely to a post, then the tractor is driven slowly down the fence row, keeping the wire under slight tension. At the end of the row, the tractor is stopped, holding the wire taut, while it is stapled to the posts. Caution must be exercised by the tractor driver not to pull the wire so tightly that it breaks. Breakage could cause personal injury as well as extra work in restringing the wire.



This Ear-Corn Rake Speeds Unloading

When unloading ear corn from a tank-type trailer box the ears tend to bridge at the center of the load, making it difficult to maintain an even flow of grain to the elevator hopper. This tendency is especially troublesome late in the season and also when the ears are slightly damp. To keep the job moving, make this efficient rake from old harrow teeth, an 18-in. length of flat steel and a handle from a hoe or garden rake. The handle should be about 5 ft. long.



MIDGET CIRCULAR SAW

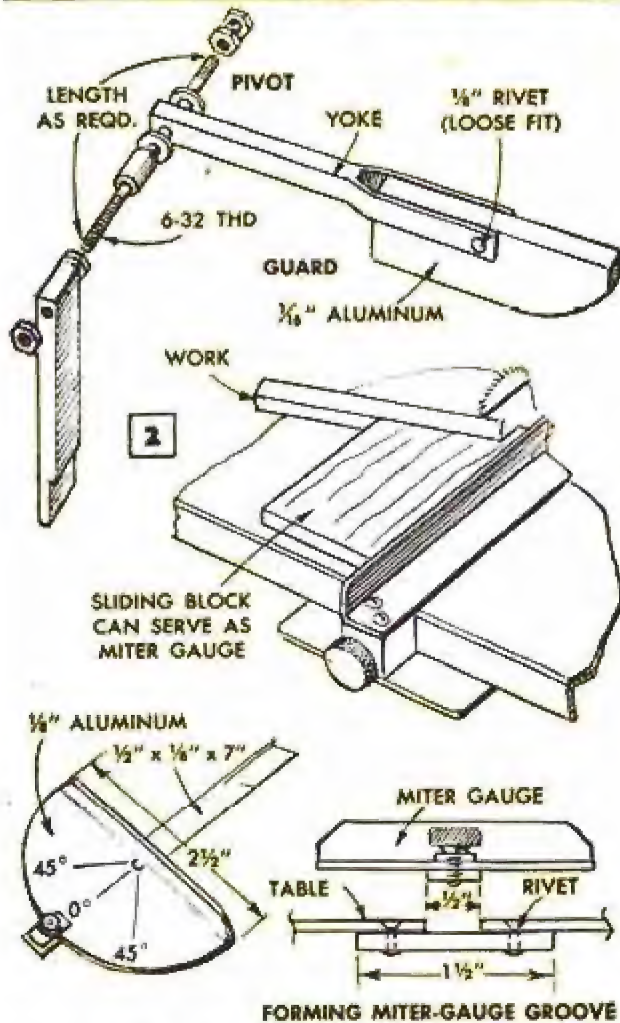
Fits on your lathe. Cuts soft metals, hard and soft woods and plastic to modelmaker's scale sizes

By Walter E. Burton

SHIPMODELERS and craftsmen who make various types of miniatures from wood, plastic or soft metals will find this tiny circular saw an indispensable item of special equipment. It can be mounted on your metal or wood lathe, the saw arbor being driven direct from the lathe spindle by means of a collet chuck or a special adapter having a No. 1 or No. 2 Morse taper as required by the lathe spindle. Various types of conventional saw blades may be used, but those made for use on milling machines generally give the best all-around service. These small circular blades are designed for slitting metal and slotting screwheads. The blades run without set and make very smooth cuts in wood, soft metals and plastic. Metal-slitting blades come in sizes ranging from about 2½ in. in diameter up. The thickness of the smaller sizes is about ⅛ in. at the teeth. As a rule, the blades are hollow ground. Some blades come with arbor holes 1 in. in diameter and must be bushed down to fit a ½-in. arbor.

No miter gauge was made for the saw pictured. Instead push blocks made from ¼-in. plywood are used. For normal cross-cuts at right angles the block is simply squared and is guided by the ripping fence. For making angle cuts a piece of plywood is cut with one edge at the required angle. However, in some types of work, where angle cuts must be made well in from the ends of long strips, a crosscut guide, or miter gauge, is helpful. If you decide that the gauge is necessary in the type of work you intend to do, then the lower details in Fig. 2 show how to make the gauge and form a groove in the aluminum table top for the guide. This will require that the table top be made in two pieces of ⅛-in. aluminum, rather than one piece, Fig. 5.

For mounting on a metal lathe the saw table is held in the milling vise as shown in photos, Figs. 1 and 6. This requires use of reinforcing, or stiffening, strips A and B in Fig. 5. These are riveted along the right-hand edge of the table as detailed. On the other hand, if the table is to be mounted



Arbor can be driven from lathe-spindle by collet chuck or by adapter having a No. 1 or 2 Morse taper. Note use of pin punch when loosening the arbor nut

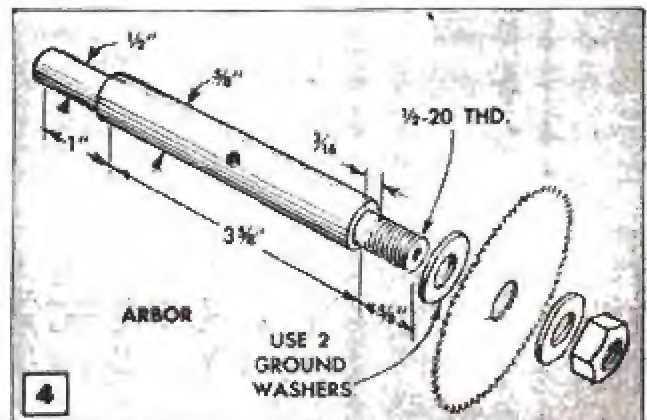


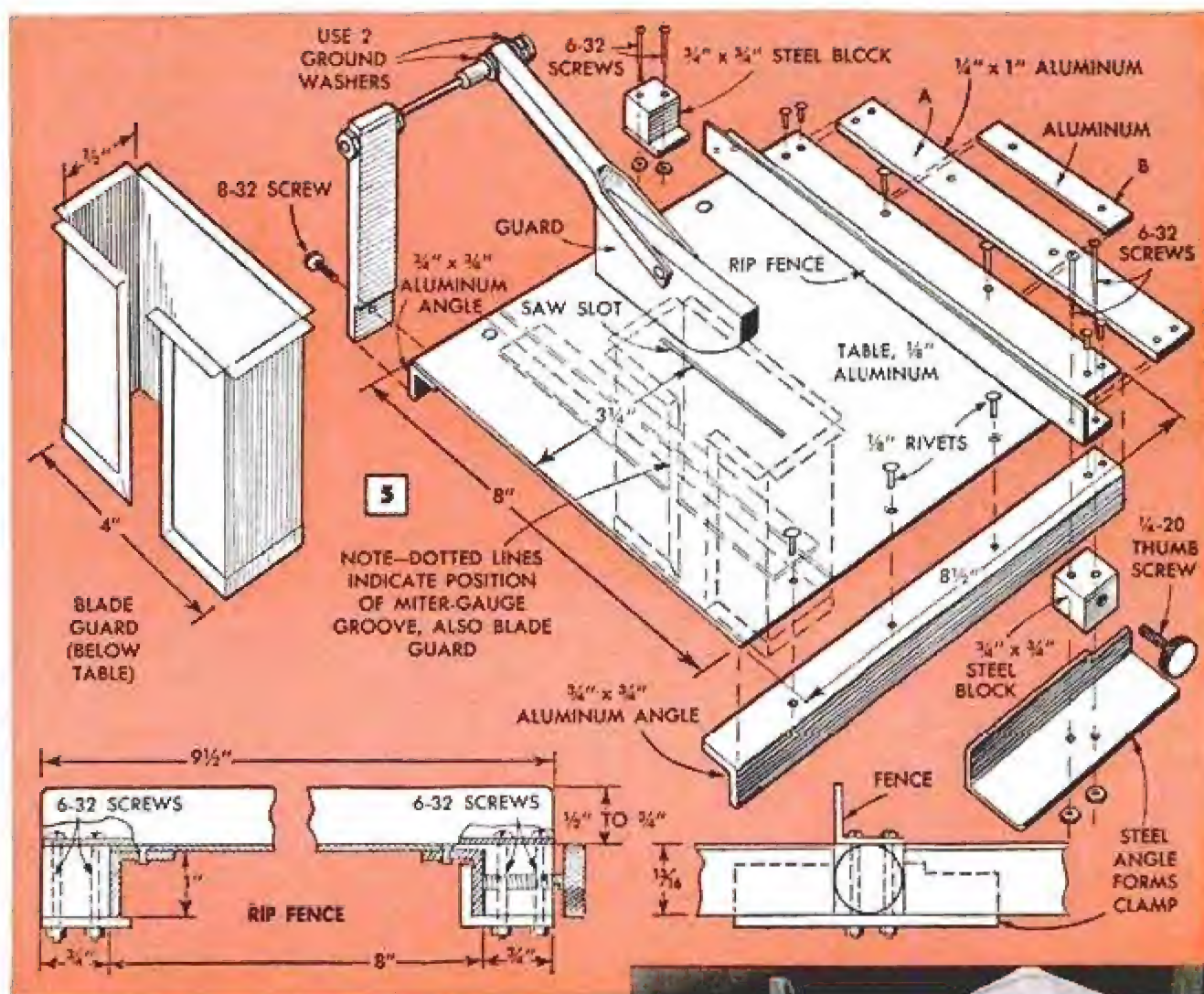
on a wood lathe, the table must be supported as in Fig. 7. The pad which fits in the tool-rest holder of the lathe consists of two parts, a $\frac{1}{4}$ -in. steel plate about 3 x 5 in. and a short length of steel shafting of the same diameter as the tool-rest spindle. The length of shafting is squared at one end and welded to the center of the plate, which is then riveted to the bottom of the table. Note that the reinforcing aluminum angles at the ends of the table, Fig. 5, are not shown in Fig. 7 for reasons of clarity. These must, of course, be used as they serve both as guides and clamping bars for the ripping fence.

Note that the saw-blade slot in the table-top is given in Fig. 5 as $3\frac{1}{2}$ in. from the left-hand edge and that the over-all size of the table is 8 x $8\frac{1}{2}$ in. Of course, the size of the table and the location of the slot can be varied somewhat. On a wood lathe the table usually can be made larger when desired. If you do not have a milling vise for your metal lathe, then the table generally can be mounted on the tool-post pad with a suitable riser block to bring the table surface to the correct height.

Construction of the ripping fence and the manner of clamping it to the aluminum-angle guides attached to the front and back edges of the table are shown in the lower details in Fig. 5. The fence is a built-up unit consisting of a length of $\frac{1}{8}$ x $\frac{3}{4}$ x $\frac{3}{4}$ -in. aluminum angle, two $\frac{3}{4}$ -in. steel blocks and a 3-in. length of $\frac{1}{8}$ x 1 x 1-in. steel angle. One leg, or web, of the latter is cut to $\frac{3}{4}$ in. in width along the length and is notched at one end to clear the reinforcing strips at the right-hand edge of the table. This arrangement of parts gives the ripping fence maximum travel to the right of the blade. Note in the sectional view, lower left-hand detail in Fig. 5, that the blocks are drilled for 6-32 screws which hold the various parts together in the assembly. The front block is drilled and tapped for a $\frac{1}{4}$ -in. thumbscrew which holds the fence in place

Arbor is machined from cold-rolled steel. Dimensions given are for 9-in. lathe having a collet chuck. Dimensions will have to be altered to fit other lathes



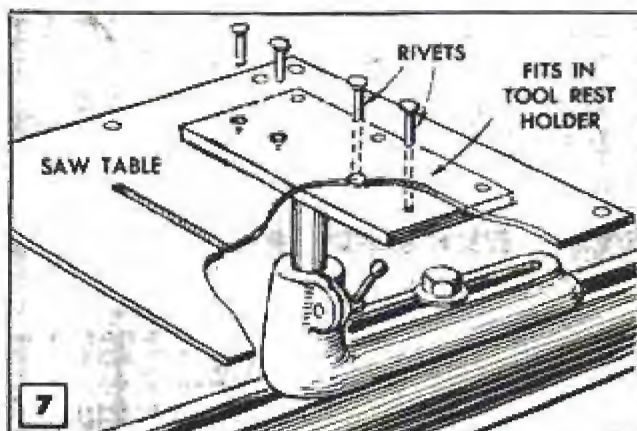


when tightened. Note that the 3-in. length of steel angle at the front of the fence serves as guide and clamp jaw when the parts are assembled. When drilling the holes for the 6-32 screws in the ends of the fence, elongate them slightly with a small round file. This will permit shifting the fence when it is necessary to align it precisely with the saw blade. Note also that in the assembly at the rear end of the fence a rectangular piece of $\frac{1}{8}$ -in. aluminum is attached to the lower face of the steel block with one edge projecting to form a lip. This engages the lower edge of the aluminum-angle guide which is riveted to the back edge of the table. A trial fit of the fence after assembly may show that it will be necessary to file the edge of the angle slightly to permit the fence to slide freely. The same may be true of the angle at the front edge of the table.

The blade guards above and below the table, Figs. 2 and 5, are optional and are purely safety features. The arbor, Fig. 4, is turned from cold-rolled steel. The dimensions given allow it to be used on a 9-in. metal-turning lathe. The arbor must be drilled transversely to permit use of a pin punch to aid in loosening the arbor nut, Fig. 3, when changing blades. ★ ★ ★



Above, unit mounted on 9-in. metal lathe. Saw table is clamped in place with milling vise. Below, table is mounted on wood lathe, using tool-rest holder

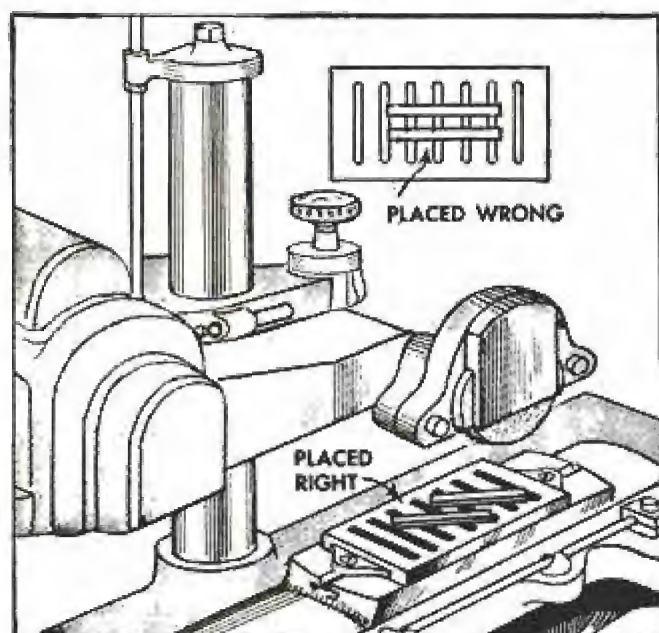


Metal Collar on Brush Controls Stiffness of Bristles



The bristles of an ordinary paintbrush often lack the necessary stiffness to do a thorough job of cleaning small parts with a solvent. A sliding collar of thin sheet metal not only enables you to gain the necessary bristle stiffness, but permits you to control the degree of stiffness simply by sliding the collar up or down on the ferrule. Cut the material for the collar from thin sheet metal, such as aluminum, and trim it to a width that will reduce the effective length of the bristles by at least half, and cut off to a length that will wrap once around the ferrule and overlap about 1 in. Then when parts require rather hard scrubbing to loosen grime, metal chips or hardened oil or grease, simply slide the collar down. When you need more flexibility, slide the collar in the opposite direction.

Placing Stock at Angle on Magnetic Chuck Disperses Heat



Dry grinding of stock on a surface grinder often causes small pieces, such as flats and parallels, to warp due to unequal dispersal of heat. This happens more frequently when the pieces are rectangular and comparatively thin and must be surfaced by grinding the long way. The tendency to heating and warping can be offset by placing the stock on the magnetic chuck at an angle with the stroke of the wheel rather than parallel with it. The purpose of placing the stock in this position is to reduce the cutting time of the wheel on each piece. The procedure is permissible, of course, only where fine grind marks at an angle on the surface of the work are not objectionable. As a rule, accuracy is affected little, if any, by angle placement of the work. Obviously the wheel must be of the correct grade and properly dressed.

Rotary Tillage Unit Is Made From Old Reel-Type Lawnmower



By welding teeth to the reel blades and shaft you can convert a discarded lawn mower to a useful purpose as a rotary tillage attachment for a garden tractor. As pictured, the reel is roller-chain driven from a jackshaft mounted on the front of the tractor frame and driven by a V-belt from the engine.

A. M. Wettach, Mt. Pleasant, Iowa.

Age Plaster Before Painting

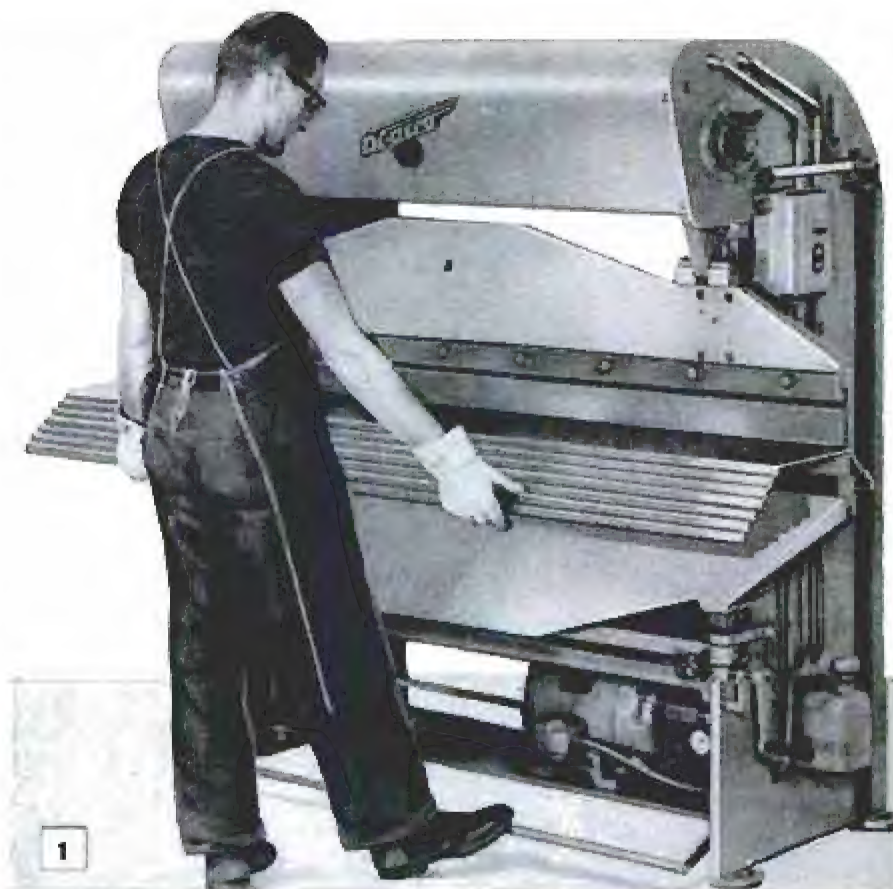
New plaster should always be allowed to age from 60 to 90 days before painting. A longer period of drying is advisable if the weather remains warm and humid. If moisture is present in plaster, paint is almost certain to peel or discolor.

1. PRESS BRAKE takes bending stock 6 ft. wide, has maximum capacity of 20-ga. mild steel. Features a stroke adjustment that permits operator to control ram through full range of punching and forming operations. Ram can be inched onto work or backed off at any point in the work cycle. Standard equipment includes back gauge

O'Neill-Irwin Mfg. Co.,
591 Eighth Ave., Lake City, Minn.

2. BENCH GLUE SPREADER has applicator roll 4 in. in diameter and 8 in. long, grooved for application of glue on tongue-and-groove stock and also on small pieces of stock which are to be face-glued or edge-glued. Also available with resilient roll for spreading resinous glues and for work on irregular shapes

Black Bros. & Co., Inc., Mendota, Ill.



SHOPPING FOR TOOLS

3. DRILL, TAP GRINDER speeds up the job of sharpening these basic tools accurately. Also handles countersinks, step drills and counterbores. Supplied in a manually operated unit and also a motorized unit. Fits nearly all standard grinder beds. Weighs 26 lb.

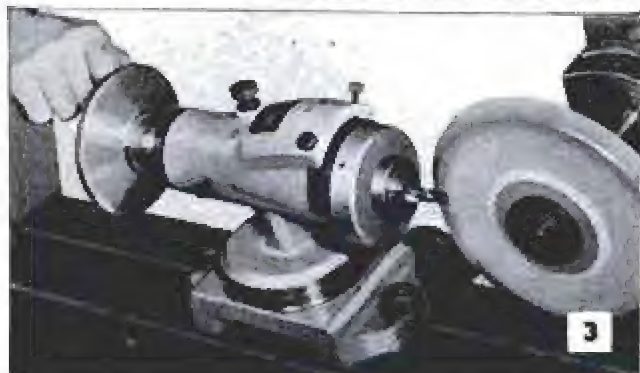
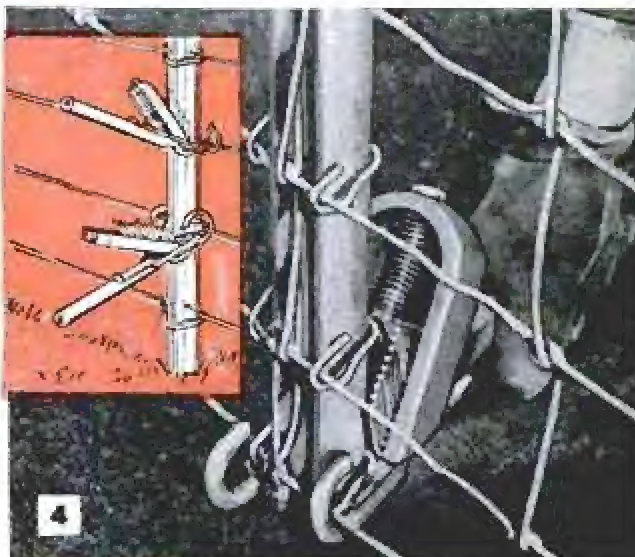
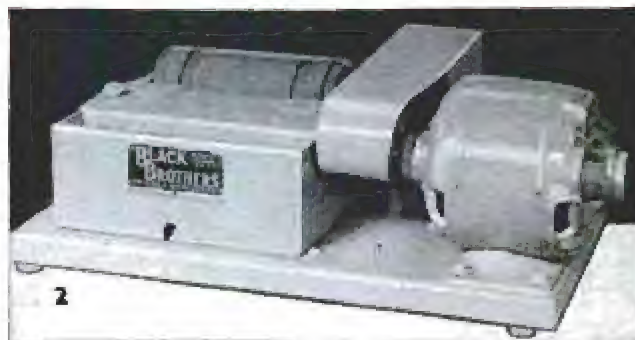
Steptool Grinding & Mfg. Co.,
3613 E. Olympic Blvd., Los Angeles 23, Calif.

4. MAGAZINE-TYPE FENCE TOOL makes fast work of attaching woven-wire fencing to steel posts with pre-formed fasteners. Holds a clip of 10 fasteners. A lever stroke closes and clinches the fasteners on the horizontal wire strands. No pliers are needed

Ingram Mfg. Co., Sioux Rapids, Iowa

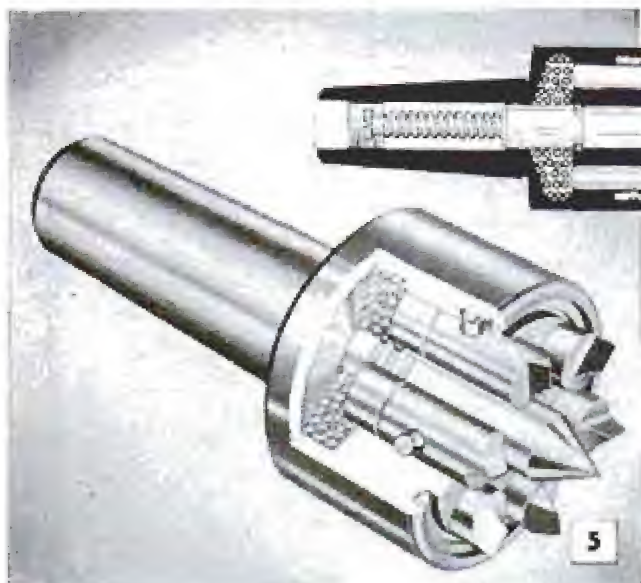
5. SPUR CENTER provides a positive direct drive for work held between centers in a lathe. Driving pins, or spurs, bear against hardened steel balls which act as a fluid, distributing pressure uniformly to all pins. Chucks, clamps or driving dogs are not required

Ideal Industries, Inc., Sycamore, Ill.



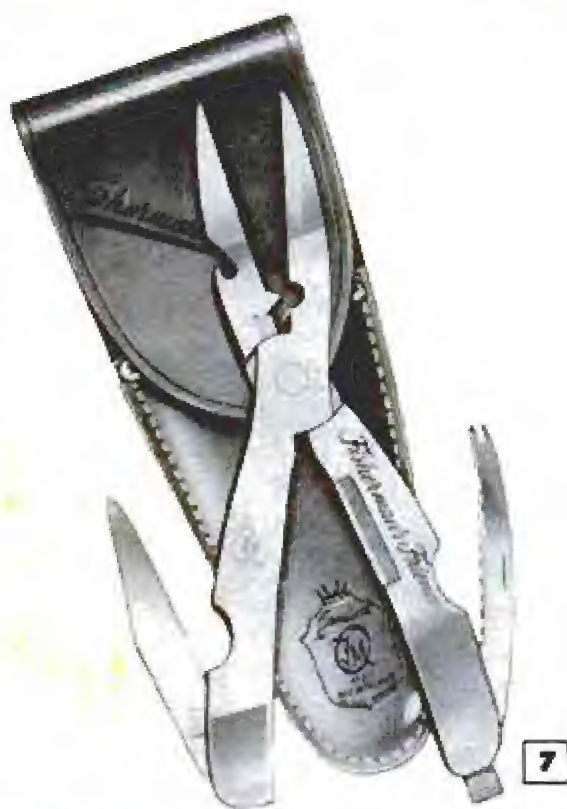
SHOPPING FOR TOOLS

(Continued from preceding page)



6. HIGH-SPEED END MILLS are designed with special flutes and cutting edges that eliminate sharp corners at strain points. Result is greater cutting mileage, higher production and much greater economy. Range of styles and sizes available for all applications

Chicago-Lambe, 411 W. Ontario St., Chicago 10



7. 12 TOOLS IN 1, it's designed especially for fishermen campers. Plierlike unit contains just about every gadget found in a fisherman's tackle box, except baits and lures. Comes in a leather sheath for attachment to belt in same manner as knife sheath

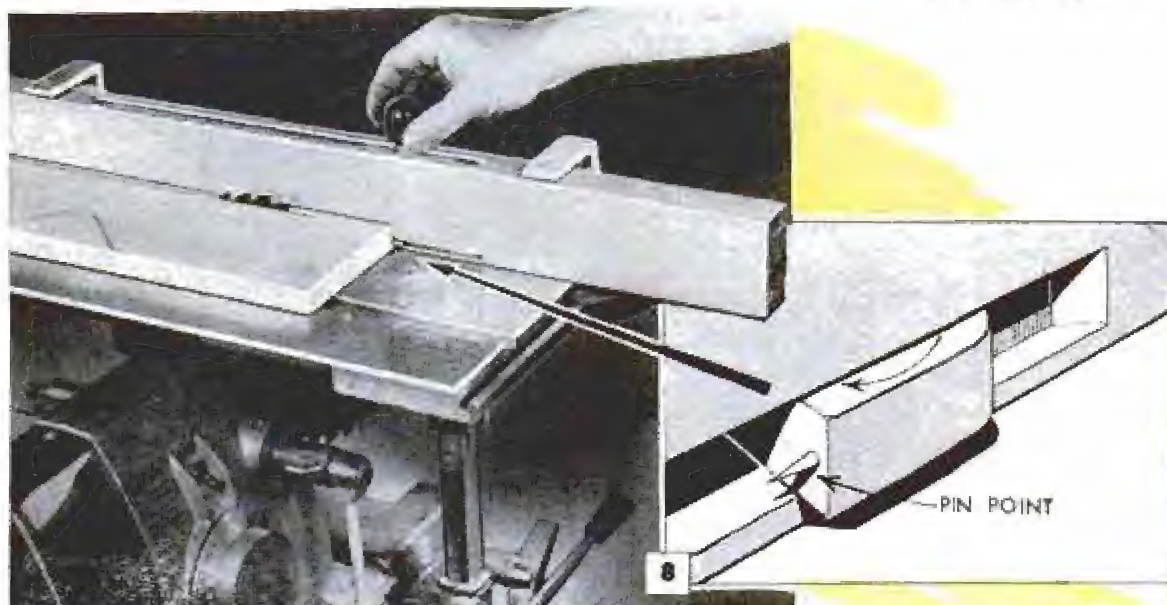
Angler's Cove, Inc., Dept. P-1, 151 E. 34th St., New York City 18

8. AUXILIARY FENCE for circular saw has built-in push stick to keep hands clear of blade when ripping narrow strips. Attaches to the regular ripping fence with clamps. Has a sliding retractable block, which carries trailing end of stock past the blade

Central City Mach. & Tool Co., 503 W. Belden Ave., Syracuse, N.Y.

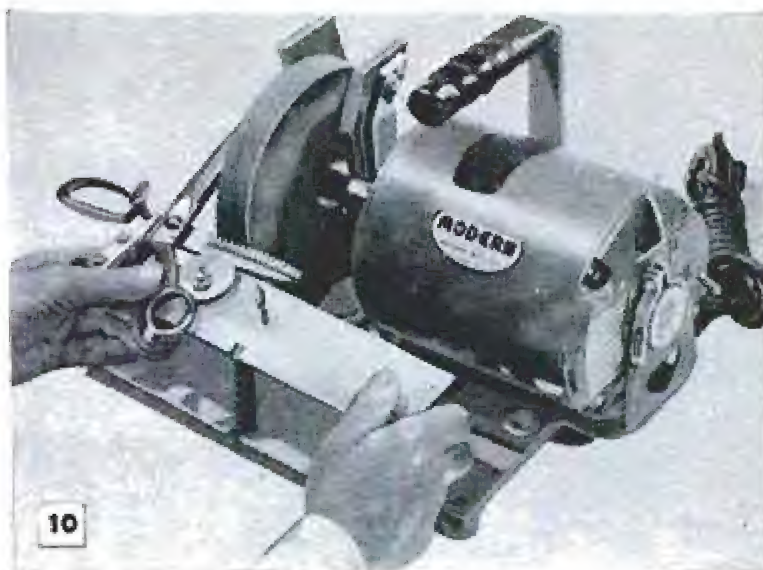
9. SELF-ALIGNING MIKE for measuring bores and holes replaces individual plug gauges because of its adjustment over a wide range of sizes. Measuring points make contact with surface to align instrument axially and radially. Measurement is read directly

Brown & Sharpe Mfg. Co., Providence, R.I.





9



10

10. MOTOR-DRIVEN SHARPENER is provided with special holders for scissors and knives. These also can be utilized when sharpening punches, wood chisels and jointer knives. Grinding wheel is driven by $\frac{1}{8}$ -hp. motor. Unit is mounted on nonslip rubber pads
Modern Mfg. Co., 160 N. Fair Oaks, Pasadena, Calif.

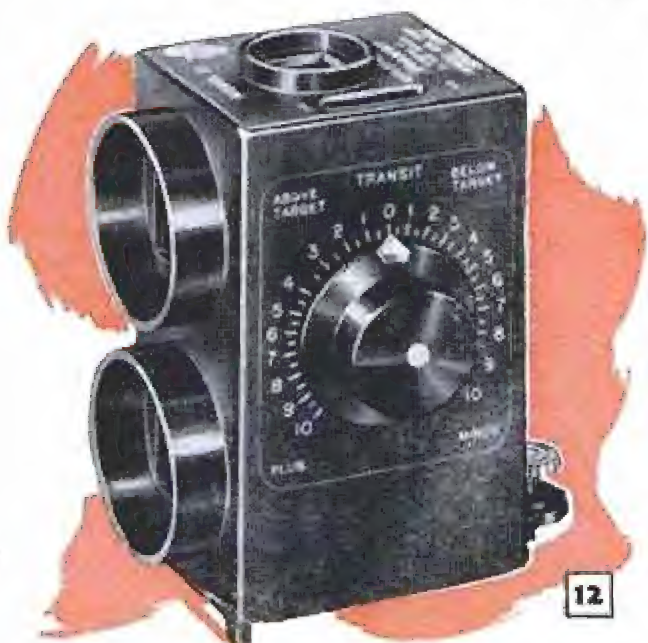
11. CENTER FINDER, or wiggler, is fitted with a tiny battery-powered bulb which lights when the work is running true. Handy for centering work in a lathe chuck and for locating work on drill press or jig boring machine. All parts made of nonrusting material
Armand Products, Inc., 20 W. Morrill Ave., Columbus, Ohio



11

12. SPLIT-IMAGE TRANSIT is used by builders for running levels, checking grades and inclines, and by farmers for laying out terraces, measuring fall of drainage tile and in fence building. Unit indicates precise levels, shows corrections by direct reading
Hopkins Mfg. Corp., Emporia, Kan.

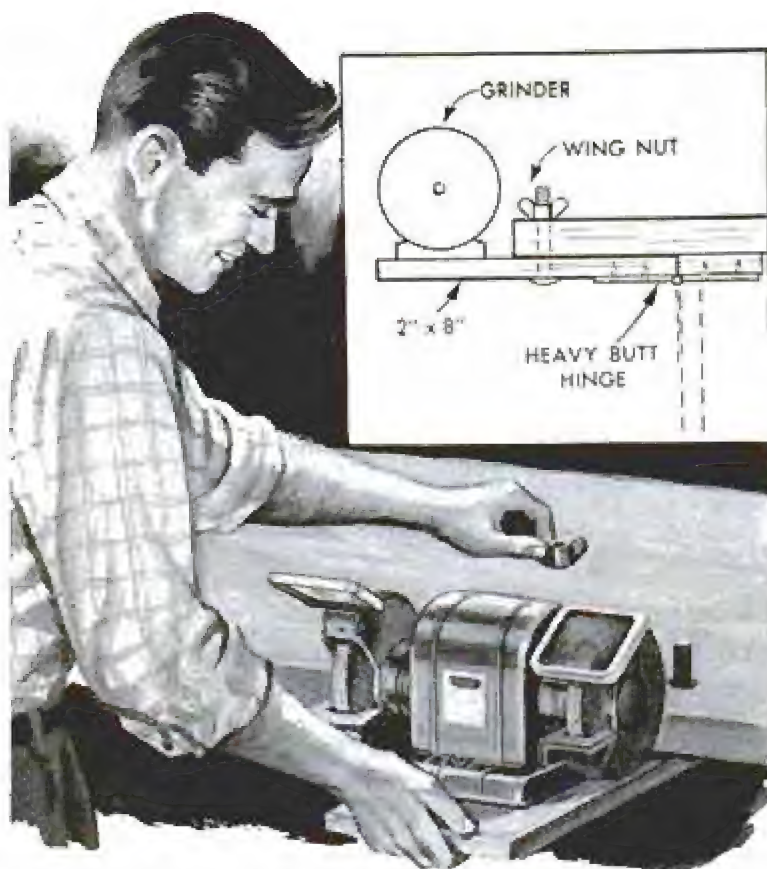
13. VAPOR GENERATOR has been designed to increase effectiveness of vapor cooling of high-speed cutting tools. Its use increases quantity production of parts and adds to cutting-tool life in many specialized applications. Plastic tank has full 1-gal. capacity
Associated Technical Sales Co.,
1926 E. Siebenthaler, Dayton 4, Ohio



12



13

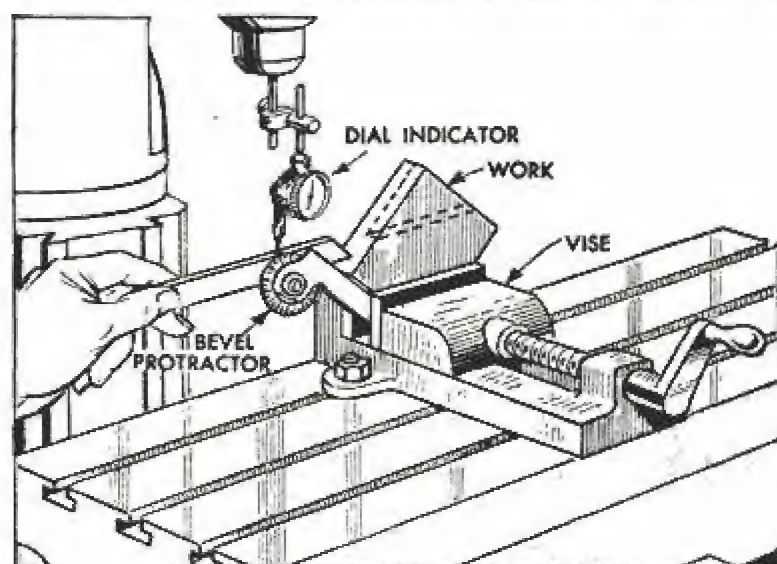


Hinged Grinder Mount Swings Under Bench

Craftsmen with a space problem will find this pivoted grinder mounting a practical solution when it is necessary to clear the bench top. The mounting supports the grinder at approximately pedestal height when the unit is in use. To clear the bench for other work, just remove the wing nut on the bolt holding the swinging section of the mounting and swing the grinder down below the bench top. As you will note from the detail, the mounting consists of two sections of 2 x 8, the shorter of the two attached to the underside of the bench top with screws. A single bolt and wing nut holds the hinged section in the working position. Sizes of the parts will depend on the type of bench and grinder.

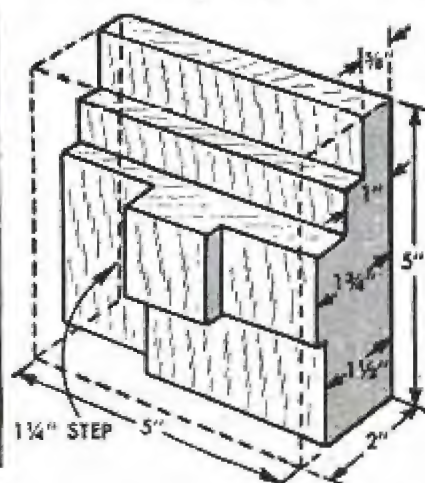
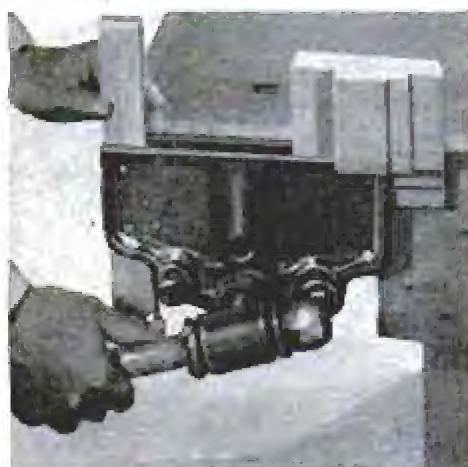
Adolph Sprenzel, Chicago.

Work Angle Set Accurately on Vertical Mill With Indicator



Setups on a vertical milling machine for making angle cuts on work of small size are made quickly and accurately with a dial indicator and protractor. Mount the work in the machine vise and position it approximately. Tighten the vise lightly. Then position the indicator and protractor as pictured, the angle at which the work is to be milled having been determined and the protractor set. Feed the machine table longitudinally, noting the indicator reading. Tap the "plus" side of the work with a soft hammer. Repeat the procedure until the indicator zeros.

Multiple-Thickness Block Aids Clamping Stock in Vise



This hardwood block overcomes the difficulty of holding narrow stock on end in a woodworking vise. The block is made by cutting a series of rabbets in two directions on one face. By varying the depth of the rabbet cuts you can make the block suitable for a wide range of thicknesses. The block and work are placed in vise as pictured. — H. B. Monroe, Rochester, Minn.

Special Bonus!

Save
\$66.67
on This Lathe

Up to \$66.67 of Accessories FREE
With South Bend 10-K Lathe

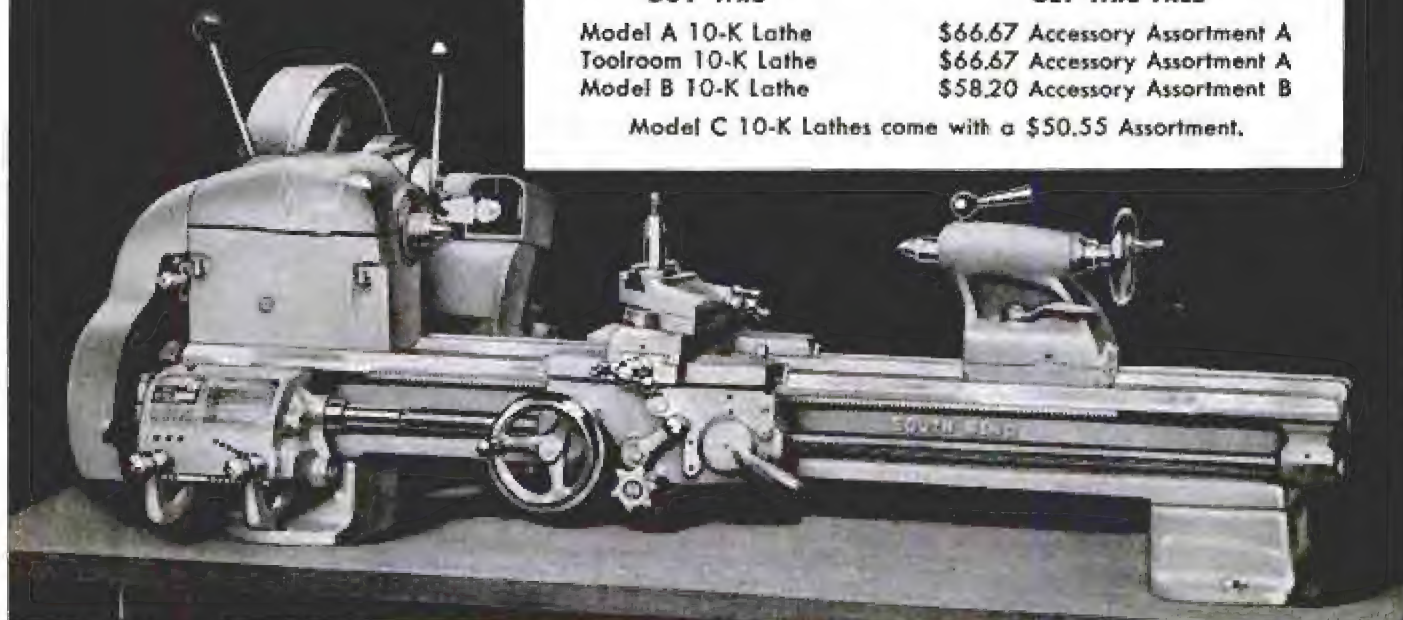
BUY THIS

Model A 10-K Lathe
Toolroom 10-K Lathe
Model B 10-K Lathe

GET THIS FREE

\$66.67 Accessory Assortment A
\$66.67 Accessory Assortment A
\$58.20 Accessory Assortment B

Model C 10-K Lathes come with a \$50.55 Assortment.



Here's your chance to get a fine South Bend 10" Precision Lathe *plus* a big assortment of essential lathe accessories *without extra charge*. Choose from 68 models and sizes for all your production, toolroom, maintenance and experimental needs. This is the first time such an offer has been made—but it ends August 31st—so act quickly. Mail the coupon now.

Model A 10-K Lathe illustrated. Model B Lathes have independent change gears instead of gear box. Model C Lathes have independent change gears and plain apron.

Accessory Assortment A

10 in 1 Tool Holder.....\$14.70
Face Plate Chuck..... 19.50
Set 21 Drills, 1/16" to 3/8"..... 11.97
Thread Indicator Dial..... 10.95
3 Dogs—1/2", 1", 1 1/2"..... 4.60
Knock-out Bar..... 1.65
Cutter Bits..... 3.30

Total.....\$66.67

No substitutions, returns or exchanges.

Accessory Assortment B

10 in 1 Tool Holder.....\$14.70
Face Plate Chuck..... 19.50
Thread Indicator Dial..... 10.95
Knock-out Bar..... 1.65
Cutter Bits..... 3.30
Center Drill Holder..... 3.50
3 Dogs—1/2", 1", 1 1/2"..... 4.60

Total.....\$58.20

10-K LATHES

12-SPEED HORIZONTAL MOTOR DRIVE

Catalog Number	Model	Bed Length	Price
CL653Z	C	3 1/2'	\$412
CL653A	C	4'	436
CL653R	C	4 1/2'	470
CL667Z	B	3 1/2'	487
CL667A	B	4'	511
CL667R	B	4 1/2'	545
CL670Z	A	3 1/2'	570
CL670A	A	4'	594
CL670R	A	4 1/2'	628
CL8670Z	Toolroom	3 1/2'	800
CL8670A	Toolroom	4'	824

Also available with 16-speed V-belt drive, and with Metal Column Base or Self-Contained Motor Drive. Prices f.o.b. factory, less electrical equipment.

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SOUTH BEND 22, INDIANA

Builders of Lathes, Milling Machines,
Shapers, Drill Presses, Pedestal Grinders



Up to 24
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South Bend Lathes, South Bend 22, Indiana

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FROM KODAK—photo aids to

NEW!

Kodak Generator Flashholder makes its own power for flash shots!

Exciting new flash idea—makes its own power! Just twirl the knob—and fire! Folds to palm-size, fits your pocket. Takes all M-2, No. 5, and M-25 flash bulbs. Simplified exposure calculator covers both EVS and f values. Two models to fit most cameras. Kodak Generator Flashholder . . . \$13.95 and \$14.95 or \$1.50 down. (Also available in a battery model, \$7.95.)

← **ACTUAL SIZE**—open for use.

NEW!

A 35mm film made especially for color prints—Kodacolor 135!

New Kodacolor 135 for 35mm cameras. Gives you color *negatives* for color prints and enlargements.

Kodacolor 135 is a fast color film (Daylight Index 32) that can be used indoors or out—without conversion filters. Try new Kodacolor 135 Film this weekend. A 20-exposure roll is only \$1.85.



help you make better pictures!



Kodak Rotary Flashholder lets you take 6 flash shots without reloading! Simply revolve magazine turret for fresh bulb. Eject all spent bulbs simultaneously, reload in seconds. Has simplified exposure calculator. Complete with Midget B-C Flashpack, two carrier discs. Two models, from \$10.95.



Kodak Filters for color pictures and better black-and-white shots. Daylight Filters (No. 85 and 85C) convert indoor Kodachrome Film to outdoor use. Skylight (No. 1A) reduces excess blue in hazy-day color shots. Kodak Pola-Screen Filter darkens sky without changing colors. Many others, from \$2.25.



Kodak Lens Converters slip on for wide-angle and telephoto movies with single-lens Brownie and Kodak Medallion Cameras. Each converter, \$18.50.



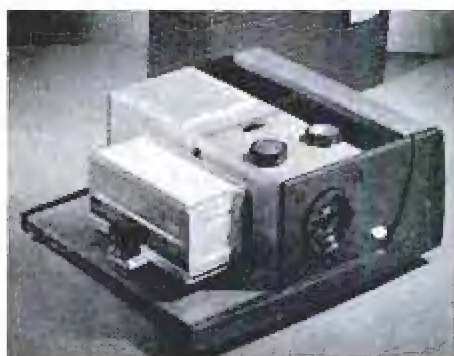
Kodak Field Cases give your camera the protection it deserves, are designed so camera is instantly usable. Smartly styled cases to fit most Kodak Cameras, from \$2.95.



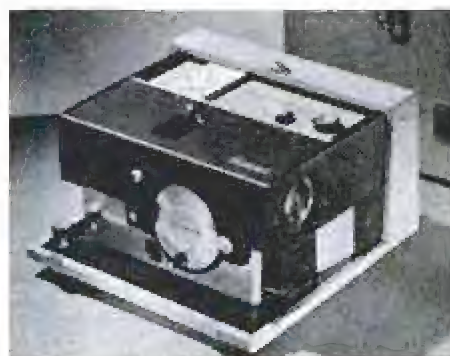
Kodak Slide Files keep your color transparencies safe and in order. Kodaslide Ready-File, above, holds up to 200 cardboard 2 x 2 slides; \$2.25.



Kodak Pocket Viewers let you view color slides in existing light, give four-times magnification. Model 1, \$2.25; Model 2, permits viewing with both eyes, \$2.50.



Kodak 500 Projector shows your color slides big and bright, yet weighs only 9 pounds! With magazine changer, \$84.50; with Kodak Readymatic Changer, \$74.50.



Kodak Cavalcade Projector is automatic—changes slides by itself! Keeps in constant focus, many other features. \$149.50 or \$14.95 down.

(Prices are list, include any Federal Tax, are subject to change without notice.)

See Kodak's "The Ed Sullivan Show" and "The Adventures of Ozzie and Harriet"

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

Kodak
TRADE MARK

How to select a paintbrush

A good brush performs better... wears longer... saves you money



Check these points when buying your next paintbrush.

First, look for a full stock of bristles in a firm, strong setting (1). Avoid brushes with loose bristles. Then inspect the individual bristles closely (2). They should be finely tapered, with slightly curled

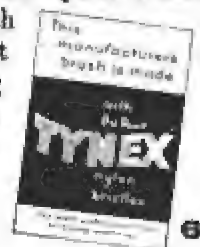
tips. Look again and be certain a generous portion (at least 10 to 20 per cent) of the bristles have tips which are split or "flagged" (3).

Your final assurance of a brush which will give the best painting performance is bristles of varying lengths (4), but with a high proportion of longer lengths.

If the brush you look at passes all these tests, it will have a greater working and paint-holding capacity and eliminate excessive dipping. It will (5) release any type finish smoothly and evenly on any surface.

One short cut to selecting a good brush is to look for the black and yellow tag, signifying a brush with TYNEX nylon bristles

(6). Properly made paintbrushes with tapered bristles of improved Du Pont TYNEX nylon give you better painting performance. They pick up a full paint load at every dip and give velvet-smooth paint-out. With proper care, brushes with durable bristles of TYNEX clean easily... rinse thoroughly... are quickly ready for another job.



FREE—"How to Choose and Use a Paintbrush." This booklet tells how to paint walls, ceilings, trim, furniture, radiators and do other special jobs. Gives tips on the correct painting stroke, how to hold a paintbrush, how master painters dip their brushes, how they clean them. Tells what kind of paintbrush to use for each painting job. Write to E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Dept., Room 537, Du Pont Building, Wilmington 98, Delaware.



TYNEX is the registered trademark for Du Pont nylon bristles.



TYNEX
NYLON BRISTLES

BETTER THINGS FOR BETTER LIVING... THROUGH CHEMISTRY

Clinic for Homemakers



As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.

Painting Brick



Q—My home has walls of common brick. The bricks seem to absorb considerable moisture during driving rainstorms and I've thought it would be a good idea to paint them. But what color to use and what kind of paint baffles me. I'm told to use an oil-base paint and also a masonry paint. Can't use both so which one?

P. N., Md.

A—You did not describe the house so we could not suggest the color or colors to use. If the walls are of sound construction and there are no voids (openings) in the mortar joints, it is not likely that moisture is finding its way to the inner face of the outer tier of bricks in any appreciable amount. If this is the case then we wouldn't paint the wall. The reason we hesitate to recommend painting the wall is that once painted, you can change the color when desired by repainting but you will lose much of the desirable texture of an uncoated brick wall. What we would do is coat the wall with a masonry sealer. This is a varnishlike material that does not color the bricks, but does penetrate and form a moistureproof seal. Be sure that the walls are thoroughly dry and remove all loose material before applying the sealer. Follow the manufacturer's instructions for application in all details.

Cleaning Paintbrush



Q—I buy a paintbrush. I use it to paint my house and I clean it in solvent when I'm finished. Six months later when I want to use it again an inch or so of the bristles are soft but the rest of the brush is rock hard. Hours of soaking in solvent won't loosen the hardened paint. Just how does one keep a paintbrush clean?

N. F., Mo.

A—Much of the difficulty of cleaning a paintbrush thoroughly is due to improper methods of handling while the brush is in use, especially when painting overhead as on a ceiling or cornice. If, for example, the brush is dipped deeply into paint at each fresh loading, the bristles will remain filled with paint at the center of the brush, especially up near the ferrule at the base of the bristles. This accumulation of paint gradually hardens, even while you are painting and is not always removed when the

(Continued to page 202)

Inexpensive

DOW DRAMA MURALS

DO IT YOURSELF!

full color 58" x 38 1/2"

\$5.75
POSTPAID

5
SUBJECTS
3 SIZES

THE
GRAND
TETONS

Showing the
174" x 38 1/2"
size

DOW DRAMA MURALS in full color produce intriguing and varied effects when they are hung in corners or breakfast and dining nooks. Used as sliding panels to conceal built in television sets, framed and hung above fireplace mantel,



FLORIDA CYPRESS GARDENS . . . Above, three-sectional mural 174" x 38 1/2" . . . Limitless decorative opportunities! Murals on sliding panels, as wallpaper . . . or with shadow boxes and planters.



WILDERNESS RETREAT . . . Bring the outdoors into your home!



WIDGEONS . . . A thrilling scene every sportsman will cherish.



SENTINELS . . . All the beauty of the sea captured in this scene.

Complete INSTRUCTIONS

for hanging Dow Drama Murals will be found on the reverse side of the story title page which accompanies each mural — a small amount of wheat paste does the trick—just like hanging wallpaper—only easier!

RUSH YOUR ORDER • SHIPPED POSTPAID • MONEY-BACK GUARANTEE

Qty.	Name	Size	Price
	Grand Tetons	58" x 38 1/2" 174" x 38 1/2" 174" x 74"	5.75 14.95 37.50
	Cypress Gardens	58" x 38 1/2" 174" x 38 1/2" 174" x 74"	5.75 14.95 37.50
	Widgeons	58" x 38 1/2" 174" x 38 1/2"	5.75 14.95
	Sentinels	58" x 38 1/2"	5.75
	Wilderness Retreat	58" x 38 1/2" 174" x 38 1/2" 174" x 74"	5.75 14.95 37.50

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LeCENTER, MINNESOTA**

Rush the following full-colored Dow murals. My money back if I'm not satisfied.

Remittance enclosed. Sorry no C.O.D.'s. Allow 10 days for delivery.
PRINT NAME AND ADDRESS:

Name _____

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Here it is—CRAB GRASS!
Your lawn's worst enemy!



Kill it NOW with WEEDONE® CRAB GRASS KILLER SODAR®

Yes, the time is *now*—before this ugly, sprawling weed really takes hold in your lawn. The way is with Weedone Crab Grass Killer Sodar—by far the most effective formulation yet developed for killing crab grass. Yet Weedone Crab Grass Killer Sodar kills this weed pest without injury to most lawn grasses, including fine bents.

You can have it in three forms—in liquid form and in powder form for mixing with water, both for use in sprayers. And in dry form for spreader application. Take your choice, but do it *now* and save your lawn!



Also larger sizes

Easy-to-follow directions on containers
(Dry form slightly higher west of Rockies)

(dry)
5-lb. bag
\$2.25

(liquid)
1-pt. can
\$1.95

(powder)
4-oz. can
\$1.25

AMERICAN CHEMICAL PAINT COMPANY

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Originators of 2,4-D and 2,4,5-T Weed Killers

(Continued from page 200)

brush is cleaned. You can avoid much of this trouble when painting overhead by dipping the brush lightly each time and slapping the bristles lightly against the edge of the container to remove excess paint. Then, when you clean the brush, pour sufficient solvent in a container so that the bristles can be immersed fully. As the brush is withdrawn from the solvent hold it vertically for a moment to permit the solvent to run down to the base of the bristles. Then bring it downward in a sharp, sweeping stroke. This motion removes not only the solvent; it also removes any remaining paint from the base of the bristles.



Air-Drying Walnut

Q—I recently purchased a small quantity of fine walnut lumber from a local sawmill. It had been freshly cut from the log when I got it. I'd like to season it properly so that I can use it later on in home-shop projects. The boards are a full 1 in. thick, 6 and 8 in. wide and average 8 ft. in

length. How should they be seasoned so that they do not warp or check when worked?—B. S., Ark.

A—You can take the lumber to a local drying kiln and have the moisture content reduced to 6 or 8 percent in a comparatively short time, or, you can air-season it yourself. The latter procedure will take a much longer period of time, but is just as effective. Probably the simplest and best way to go about it is to coat the ends of all pieces with hot asphalt to prevent too rapid drying of the boards near the ends which will result in checking. Next, cut short lengths from 1 x 1-in. strips, each strip slightly longer than the combined width of 3 boards. Then stack the boards in an open shed or in the garage. Begin the stack by placing the first board (on a level surface) on the 1 x 1-in. strips spaced not more than 2 ft. apart. Make sure that this board is straight, not twisted or bowed by an irregular surface. Then place 1 x 1-in. strips on top of the first board, spacing them the same as those under the board. Place the second board on these strips and continue this same procedure until all boards have been stacked.

Condensation on Pipes

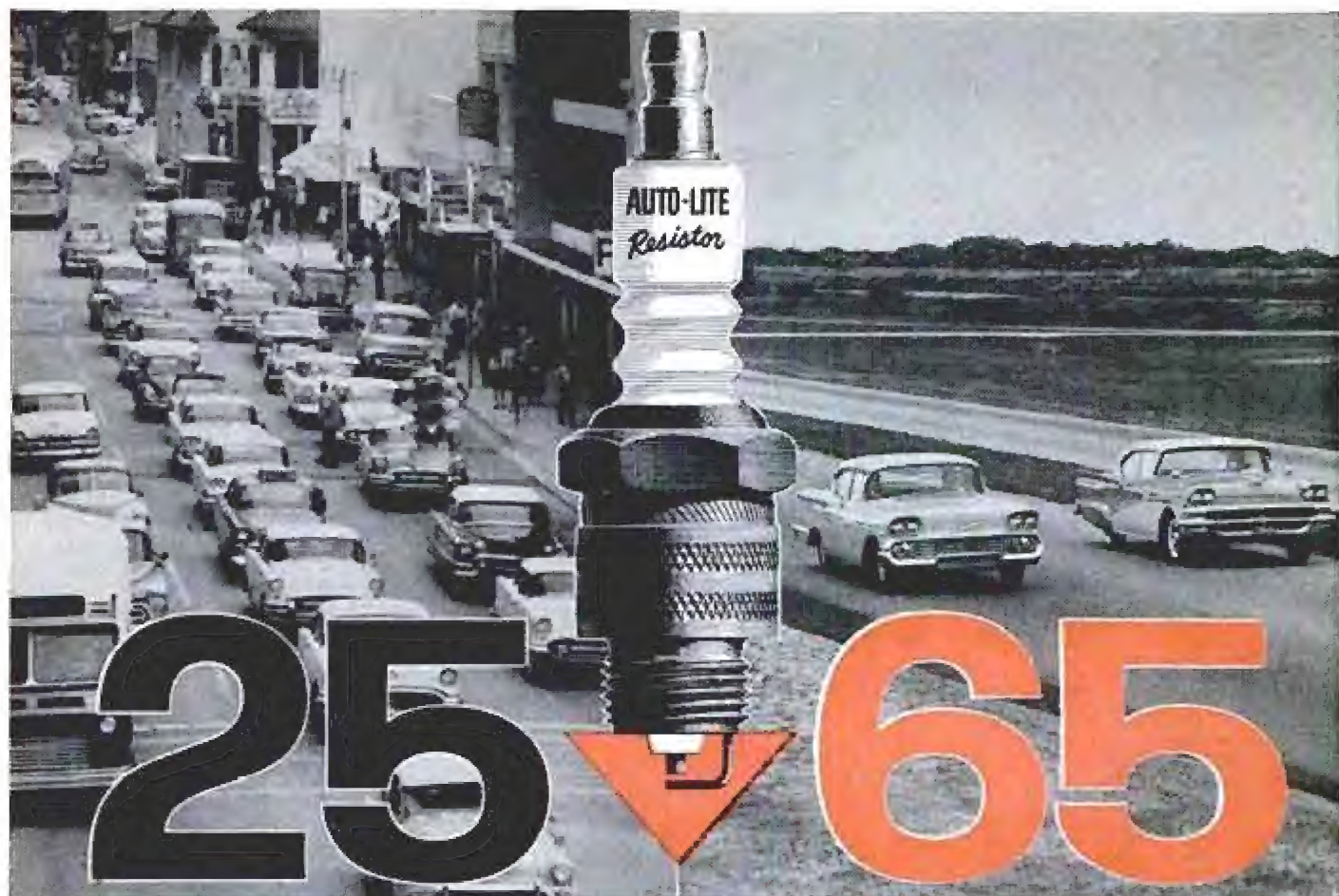
Q—The cold-water pipe that runs from the meter across my basement to the bathroom sweats during the summer months. Water dripping from the pipe and the meter dampens the floor over quite a large area. What can be done to prevent this, or at least minimize it so that it is no longer troublesome?—E. H., Ga.

A—There are several ways of preventing condensation on pipes carrying cold water. A wrapping of several thicknesses of newspaper is quite effective but, of course, is rather unsightly in an exposed location. There also are several materials made especially for the purpose. These are in the form of insulated wrappings and in the heavy-liquid form for painting directly on the pipe with a brush. Ask your local hardware dealer.

Plaster Patches Show Under Paint

Q—Recently I redecorated two rooms in which the plaster required some patching. My problem is that the plaster patches show quite plainly even under the two coats of paint I applied. Did I do something wrong, and what can I do to remedy the defect?—W. N., N. Y.

A—Did you trowel or sand the surface of the patching plaster flush with the surface of the old plaster? And did you coat the patches with an undercoater before painting? Carrying out these preparatory steps is quite essential to the success of a paint job over patched plaster. However, it is probable that you can salvage the present job as it stands simply by coating the patches with an undercoater to prevent absorption of the final coat of paint, which should be applied only after the undercoater is thoroughly dry.



IN TOWN TRAFFIC . . . some spark plugs, designed for high speeds, become fouled and cause misfiring and loss of power when driven at low speeds.

ON THE HIGHWAY . . . some spark plugs, designed for low speeds, misfire causing power loss and invite destructive pre-ignition when driven at high speeds. Why gamble when . . .

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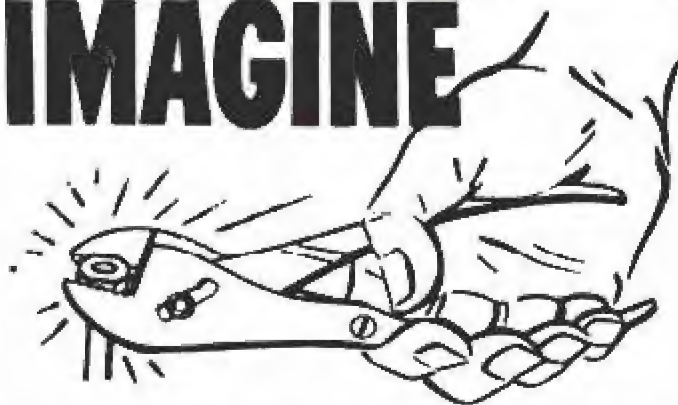
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You Can Catch More Bass

(Continued from page 129)

the summer months. The time to try it is when the water is glassy smooth, so you can see where the fish jump in their feeding. You sit in your boat and wait until a fish jumps within range. Then you cast directly for the circles or just beyond them and bring the lure back over the spot. If your accuracy and timing are good there's a fine chance you'll tie into a hungry bass. Favorite lures for this style of bass fishing are darters with double spinners.

"Jigging" for Bass

Another highly productive bass-fishing plan practiced in these lakes is one called "jigging," and it's helping anglers catch bass even when the waters are muddy in early spring or late fall. Kentucky fishermen insist this is the deadliest method of all for taking big strings of fine bass.

This is for the rugged fisherman willing to brave rough weather because jigging is done in winter and early spring. You bait with gobs of night crawlers on a large single or treble hook. Both the tackle and the fishing method are simple. First requirement is a long pole, at least 16 feet long. The line is heavy monofilament, 20 to 40-pound test tied at the tip of the pole and again at the butt for safety's sake in case a big bass breaks the tip off the pole. Let the line hang down four feet from the tip. Place two or three No. 5 split-shot sinkers above the hook.

With this jigging rig you sit very quietly in a boat and drop the bait into the water around brush, logs and rocks. Work the bait up and down slowly about a foot below the surface. Once the bass swallows the bait you're in for a fight. Jigging is a long way from casting the dry fly, but it brings a lot of bass out of the wet, especially in the big reservoirs.

Before you go bass fishing this year add a small hook-sharpening stone to your tackle equipment. It may save you several fish during the season. A bass poorly hooked stands a good chance of going free, and dull hooks account for many a "heart-breaking" lost bass.

Retrieve Slowly

Most anglers who fish with artificial lures fish them too fast. Slow down the retrieve and you'll tease more bass into sampling your lure. When casting the edges of a lake with a surface bait, it's a good plan to let the bait rest until the water smooths out around it. Some anglers drop the bait into a likely looking spot and count to 30

(Continued to page 206)

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before twitching it. Then they move it slowly and let it rest again. Many an angler has learned this lesson by pausing to light a smoke after he has made a cast. Then he picks up his rod, gives the bait a twitch and ties into a big bass that has been waiting for the bait to move again. If you're using a deep-running bait such as a spoon or leadhead, you'll often take a bass as your bait settles toward the bottom.

If slow retrieves aren't working, try bringing in the lure a little faster. Vary the technique from time to time but bear in mind that slow going gets bass.

The angler who makes a study of his fishing waters catches more bass. Seasoned anglers have favorite places where they like to fish. They know these waters and they know how deep they are and the contour of the bottom of the lake. They know the location of rocks and logs where bass hang out. Their ability to read the water enables them to develop a plan for fishing.

Time spent studying the water and the habits of bass is never wasted. Bass don't ask any man to take them from the water. Bass fishing is a man-against-fish campaign. It's a sport filled with question marks. But follow the tips from the old-timers and you'll find answers to many of the questions that may puzzle you. ★★★



British Motor Scooter Has Built-in Basket

Housewives in England who go to the store in motor scooters don't have to drive home balancing a sack of groceries on one knee. There is a roomy storage compartment built into the windscreen just below the handlebars. The new scooter has a plastic body on a tubular-steel frame. It is said to go almost 100 miles on a gallon of gas and has a top speed of 55 miles per hour.

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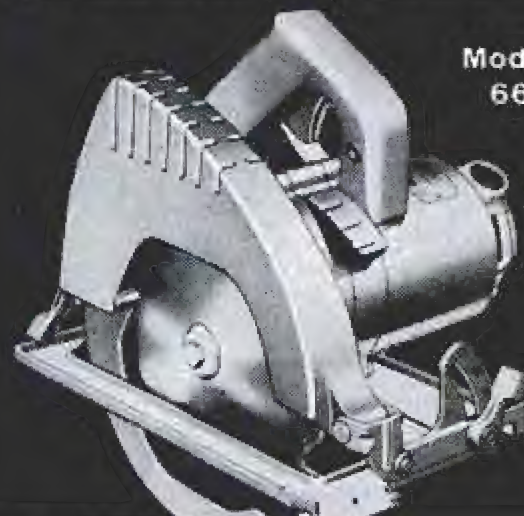
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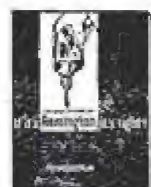
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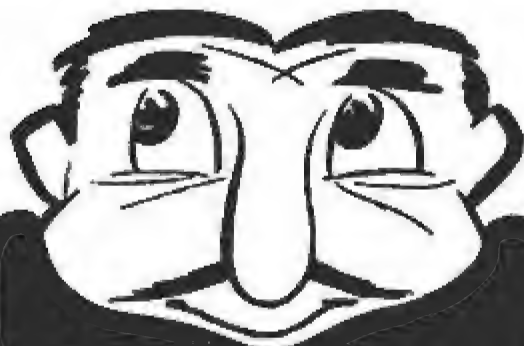
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Our First Guided Missileaires

(Continued from page 124)

cylinder with a rear end that flares out and away from the Snark's side at an angle calculated to thrust the missile into the sky at the proper altitude and velocity.

Minutes before launching, the Snark's engine is started. A Scorpion F-89 flies overhead, waiting for the bird to become airborne. With four minutes to go the engine is throttled up to 95 percent of power. With one minute remaining, a siren blast warns of the impending launch. Ten seconds before the Snark takes off the F-89 flashes over the launch site, ready to join the missile on its flight. Its crew will observe the missile's characteristics. Flame shoots out from behind the poised missile as the rocket boosters are turned on. Then with a roar it leaps into the air, and seconds later is a dot on the horizon heading southeast over the ocean range.

The missile airmen, in training, will bring the long-range missile back to the launching site for recovery. The Snark lands on special stilts. On these flights a ground-station radio "pilot" takes over and lands the Snark.

The 69-foot Strategic Missile 62, as the Snark is officially known, is a cruiser-type pilotless bomber endowed with the load-carrying capabilities and the range of the B-52 although it costs 95 percent less. It is regarded as a stop-gap missile to supplement the B-52s and B-58s until the time when rocket-powered intercontinental ballistic missiles are operational.

It looks as if Dick Beck and his missile airmen are the forerunners of a new era in the Air Force. ★ ★ ★

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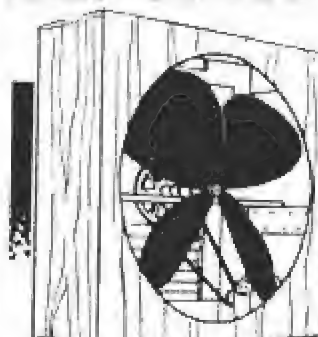
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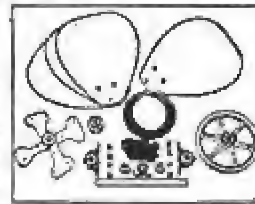
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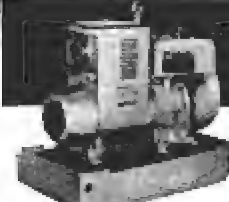


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Detecting Bootleg Nuclear Tests

(Continued from page 105)

subterranean blasts. "If we can't get Russia to let us set up stations inside her country," Dr. Orear says, "the microbarometer can still do a great job pinpointing most bombs from 'way off.'"

Scrutinizing the Atmosphere

Newer and more curious than microbarometers are the simple devices that scrutinize the outer reaches of atmosphere for signs of greater than usual "electromagnetic radiation."

"A nuclear bomb," Dr. Orear explains, "creates a tremendous flash of intense light. A lot of this light is scattered by the upper atmosphere—just like the afterglow of a sunset. You still see twilight in the evening sky until the sun is 18 degrees below the horizon. The same phenomenon will make the sky glow due to a nuclear explosion that may be far beyond the horizon. All you need to detect it is a photocell, similar to the one on your camera lightmeter. It won't matter if it's rainy, cloudy, clear, night or day. Your photocell will quickly detect the slightest pulse of light against any steady background of sky light, bright or dim."

One Orear idea is to suspend four photocells high in the air, pointed to the four quadrants of the sky. Constantly monitoring sky glow, they would transmit telltale variations to the detection station.

"Such pulses of light from a nuclear flash," says the physicist, "come through in a double wave—first the abrupt flash, then a second pulse that dies away slowly. By timing the dying pulse, it's possible to determine the size of the bomb. What's more, if you had the precise arrival instant of the first flash at three or four scattered stations, you could triangulate the location of the blast."

According to Dr. Orear, rockets or satellites equipped with photocells could also do a good job of monitoring bomb-activated sky glow. The photocell detection method, he points out, would also take care of high-altitude nuclear tests that anyone might try to hoist out of "sniffing" range. "The shape of the light pulse will be different up there," he says, "but there would still be plenty of visible light."

Even the highest flying nuclear bomb would have a hard time escaping the sensitive eye of photocell monitors. "There's no reason why they couldn't detect a bomb's light flash reflected off the surface of the moon, too," Dr. Orear says, significantly.

Besides light, a nuclear bomb radiates radio noise that will reveal its presence. The AEC has been using this system

successfully for some time. "Detection by electromagnetic radiation in the form of visible light or radio noise from the ground," says Orear, "is only good for about 500 miles. But with stations inside Russia spaced only 450 miles apart, it should work for aerial detonations of almost any size."

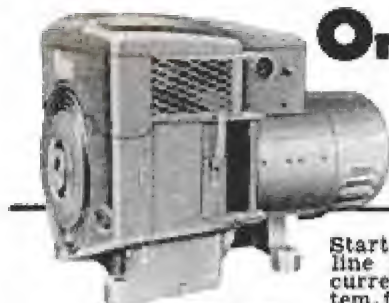
Measuring the radioactivity of the air from day to day is a tried-and-true method of detecting all but the deepest subsurface A-blasts. This is what the shuttling AFOAT planes do now. They speed up the process of pinpointing Russian blasts by sampling air close to the site. Actually, nearly every big city in the world has a "fallout" detection laboratory on some roof in town. Given time, they can produce a wealth of information about who is shooting off what, and where. Various collecting devices are used. One of the simplest is a vacuum pump that pulls air through a filter that is put under the "window" of a geiger counter after a period of exposure. The counter will click away the story of almost any bomb anywhere by producing a sharply rising curve in the count of radioactive particles as "loaded" air is sucked through the filter to deposit its hot dust. More common are one-foot-square air samplers of plastic, through which air is drawn for 24 hours. Later in the laboratory, sheets may be burned and radioactive particles studied under special counters encased in lead caves to cut out random cosmic rays. Such radiation counts can be revealing. Dr. Orear produces a Japanese map on which Nipponese weathermen plotted an amazing series of sea-level fallout calculations. In 1955, by charting the direction and speed of the air streams that carried what they call the "death ashes," and estimating the decay time of the radioactive particles they found, the Japanese tracked those "death ashes" back to a point smack dab in the middle of Nevada. Those tests involved some of the smallest yield nuclear devices ever triggered in this country!

"Clean" Bombs

What about so-called "clean" bombs? "Our best attempt so far," says Dr. Orear, "was 96 percent clean. A 100-percent clean bomb is a practical impossibility. Because of neutron-induced activity in the bomb shell and atmosphere, all except deep underground tests will produce radioactivity which may be detected."

As for underground bombs, seismographs—those delicate instruments that record earthquake tremors clear around the world—do a pretty good job of "hearing" even small nuclear explosions buried in mountains.

(Continued to page 212)



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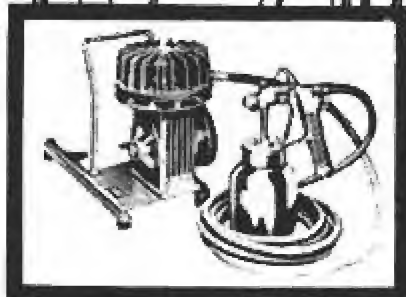


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"Nearly all tests," says Dr. Orear, "whether underground or not, give rise to seismic waves in the earth's crust. These can be detected by seismographs across surprising distances." Even the 1.7-kiloton baby bomb buried in a Nevada mountain last fall was picked up on seismographs in Alaska 2300 miles away.

What about earthquakes that might come out looking like bombs on the instrument's drum? Russia gets about 50 each year which are larger than a 1.7 kiloton bomb. "There are differences" Orear points out. "One standard procedure is to measure the direction of first motion." Actually, seismographs are so sensitive that even relatively feeble explosions will activate them. One conventional TNT blast of a .06-kiloton yield registered on the drum of a seismograph 240 miles away.

"Since it is apparently possible to make an A-bomb with no more wallop than a firecracker," says Dr. Orear, "this poses the problem of how to tell whether someone has shot off a nuclear device or a conventional chemical weapon." The physicist's answer to this one is that United Nations observers could be present at any conventional weapons-testing activity that might register on the monitor.

Tricks to Hide Tests

Dr. Orear has given considerable thought to tricks that might be tried in an effort to hide any nuclear-test firing. "It would be entirely possible to fuse an underground nuclear bomb so that it would be triggered by an earthquake," he admits. "On the face of it, that sounds like a clever way of hiding an explosion. But it is risky. First of all, Russia only gets about three quakes a year that register a magnitude of six—enough to muddle a small-bomb signal. Even at that, a small bomb's seismic waves would 'ride' on top of the quake signal, and we'd know something was up."

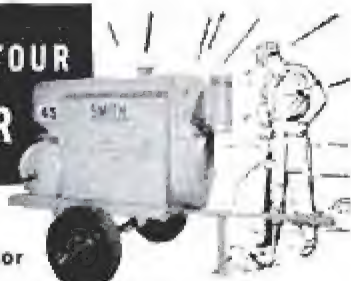
Actually, Dr. Orear has calculated a way a nuclear device might be fired without anyone knowing it. "You could build a sphere of about eight-inch steel plate," he explains. "It would be 500 feet in diameter and would weigh 100,000 tons. If you sat this on sturdy columns sunk in soft ground, it would actually stand up under a one-kiloton nuclear explosion. It would trap inside all acoustics, flash, seismic waves, radio emission and fallout. If you wanted to test a five-kiloton bomb, you'd have to increase the wall thickness five times. It would work, all right. But it would be a tough, expensive job. And under such conditions it would be tedious and limited. Anyone who tried it would deserve what he'd have to put up with."

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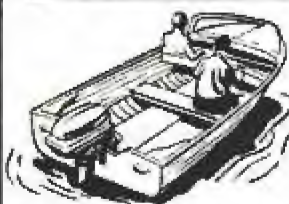


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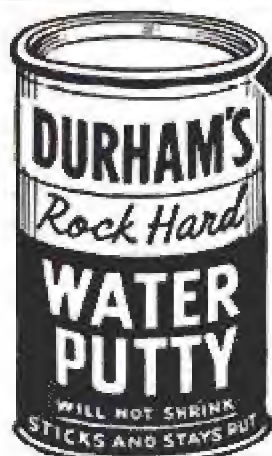


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The Karlson Acoustic Transducer For Hi-Fi and Music

(Continued from page 136)

size, it is capable of providing exceptional bass response, uniform dispersion and extraordinary efficiency over a wide range of frequencies with only a single, good loudspeaker. This transducer is characterized by a tapered opening which was regarded, by many, as a decorative rather than a functional feature. Instead, this tapered opening is the subject of several basic patent claims. (Patent No. 2,816,619.)

In operation as a speaker enclosure, the Karlson transducer achieves an unusually wide response, ranging from the lowest frequencies in the audio spectrum to the highest frequencies obtainable with any particular speaker drive unit, thus providing a well-integrated sound from a single source. Since the speaker can be matched to this transducer so that its cone size is virtually expanded to that of the tapered opening, the apparent size of the speaker is materially increased. The enclosure is designed to utilize both the front and back waves of the speaker in order to provide highly efficient operation. This gives us the great dynamic range so necessary for reproducing all sounds, from the weakest to the strongest, within the range of human hearing.

The Karlson transducer acts much like an open-ended pipe with a long, exponential opening. The effect of this opening is to smooth out the normally humped response of the ordinary pipe, see Fig. 3, to a virtually flat curve. In the bass region, such loading provides an exceptional range and dynamic output. In the midfrequency region, the combined front and back loading which the enclosure exerts on the speaker cone also keeps the motion of the cone to a minimum, practically eliminating the rim resonances, cone breakup and other spurious effects which normally occur in the midrange in almost all cone-type speakers. In the high-frequency ranges, the action of the tapered opening provides a broadly fanned signal which illuminates the listening area uniformly and eliminates the stridency and raucous qualities associated with high-frequency "beaming."

Since the introduction of this enclosure we have received numerous requests from hobbyists, schools and rehabilitation centers wishing to construct the unit in their own workshops. As a result, we are now permitting the publication of these plans as a public service feature in conjunction with this magazine, provided of course, they are not used for professional or commercial purposes. Since this is a patented

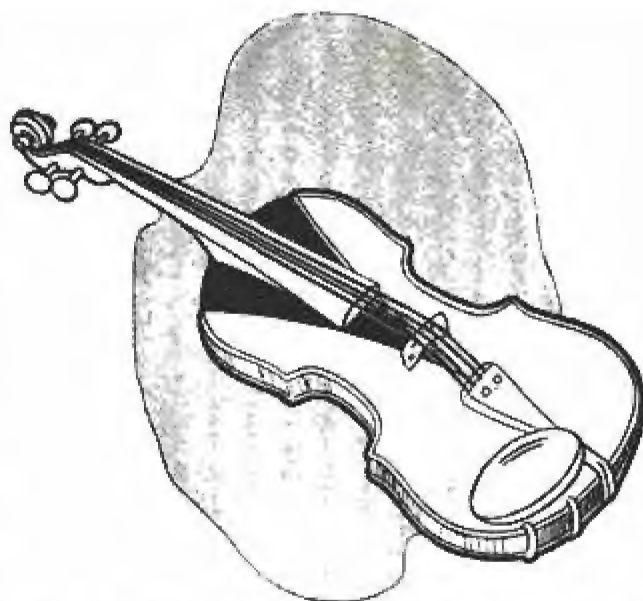


Fig. 4. Instrument of the future? The Karlson design principle may be applied to musical instruments as well as speaker enclosures for improved performance

invention and all plans are copyrighted, all such manufacturing, use or sale is strictly confined to licensees.

Construction of the Karlson '12,' as shown in Fig. 1, will involve an estimated 60 hours' work on the part of the skilled hobbyist equipped with a full complement of tools. Those not so equipped can make this enclosure from the precision cut kits which are commercially available. Assembled units are also sold in unfinished and finished form (Karlson kits and enclosure are also available for 8-in. and 15-in. speakers).

The Karlson enclosure may be applied wherever better sound is required, whether it be in electronic organs, hi-fi sound systems, theater systems or musical instruments. In the future we expect that violins resembling that shown in Fig. 4 may even challenge the superiority of the old masters. In any event, this invention is already causing a not-too-quiet revolution in sound by opening up new standards of perfection never before quite realized. ★ ★ ★

Birds Aren't Bothered By Ultrasonic Tests

Experiments in Canada have shown that birds cannot be driven away by blasts of high-frequency sound above the limits of human hearing. The belief that birds could be repelled by ultrasonics has persisted for some time, despite lack of supporting evidence. But the tests showed that wild ducks, proving a serious problem in Canada because of their depredations on western grain fields, did not seem to notice the ultrasonic frequencies, though they do respond to sounds that annoy humans.

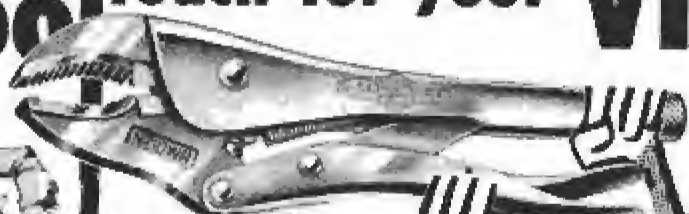
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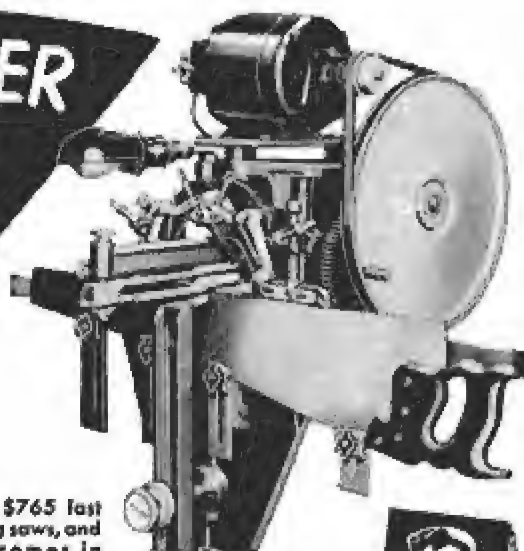
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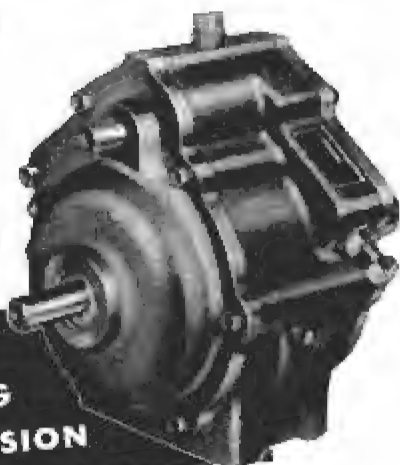
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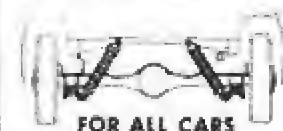
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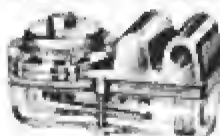
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What's Behind the Doors?

(Answers to quiz on page 125)

ALL THE PHOTOS were taken in the Miami, Fla., area, where population growth and demand for added public and utility facilities have resulted in much new building and have given architects and city planners an opportunity to design service buildings to harmonize with the surroundings.

1. In the northern section of Miami Beach, thousands of motorists pass this building every day without being aware of what it is. It houses a unit of the Miami Beach Fire Department. When the two garage doors are closed, the building readily passes for a home on the Inland Waterway.

2. This really isn't a building at all, but a concrete shell for deception. Inside is a power-distributing substation of the Florida Power & Light Company, a necessary but unattractive installation. Located in Miami Beach, just a few hundred yards from a fashionable shopping street, this roofless structure frequently is mistaken for an apartment house.

3. Most of this attractive municipal building is occupied by a rectangular 750,000-gallon water-storage tank. The town of Surfside, a residential community on the Atlantic Ocean with high property-zoning standards, needed a new town hall, but it also needed a water storage tank. The administration decided to build their new town offices around the storage tank, thus combining utility and beauty. And no residents could complain that a water tank depressed property values, as might have happened had the tank been located separately.

4. When the city of Coral Gables consolidated and enlarged its sewage treatment facilities, the administration sought to beautify the plant, to make it an attraction rather than a potential eyesore. Muralist John St. John was commissioned to paint a symbolic history of Florida on the circular walls of the sewage digester tanks. "We wanted to be a good neighbor," explained William C. Tims, superintendent of the city's division of sanitary sewers.

It's Easy to Repair

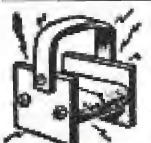
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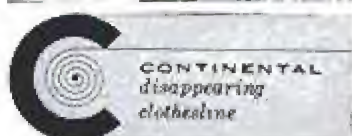
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GET ESTIMATE AT LUMBER AND BUILDING SUPPLY DEALERS

Lincoln Owners Rate Styling Its Best Feature

(Continued from page 113)

Lincoln blames a faulty switch for the antenna trouble. It's corrected now. But why should customers (who spend enough to get the best) have to suffer? There's much talk about proving-ground tests, but these are with preproduction cars. Customers don't buy prototypes, they buy production models.



LINCOLN CLEVERLY USES ITS FRONT-DOOR ARMREST AS A DUCT TO PIPE HEAT INTO BACK SEAT

Detroit stylists say the public demands big, roomy cars. So they make long, wide cars too low to enter. If they really believed the public wants more room, they'd make cars higher.

Lincoln does have lots of room inside, once you get in. The front-seat passenger has abundant kneeroom due to the concave dash. Interior looks elegant, as a fine car should. Instrument panel in excellent taste, but dials may be too small for oldster's presbyopia.

"Engine burned out and threw a rod at 500 miles."—Ohio consulting engineer.

"Oil pump broke and froze up engine at 870 miles. Had to get new engine."—Ohio businessman.

Fourth on the complaint list of the owners is the electric-antenna system and the radio itself. This is followed by shock-absorber troubles and faulty heaters.

"Transistor radio and power antenna defective and difficult to repair."—California lawyer.

"My biggest gripe is that I own, lock, stock and barrel, a brand-new 1958 Lincoln that cost \$7000 and the electric-controlled radio antenna has never worked. One part has not been replaced on it because the dealer can't get it. My patience is running out."—Washington owner.

"I keep having to have my shock absorbers replaced. I've had two installed in two months."—Louisiana executive.

"Am without a car right now as it's tied up waiting for second set of shock absorbers."—Washington contractor.

"Heater-air-conditioner all on one switch is very poor arrangement. Mine will not work. Mechanics can't fix it. They say it should be modified."—Indiana owner.

"Heater does not have fine enough adjustment. Either too hot or too cold."—Utah manufacturer's agent.

Suggestions to Industry

On each questionnaire mailed to owners, *PM* asks for suggestions for the industry as a whole, not just for the car being tested. Here are some typical remarks by owners of the 1958 Lincoln:

"Cut out the wraparound windshield and make more room for knees in getting in and out."—Oregon retired owner.

"Try to allow more room to get legs under the steering wheel."—Washington retired owner.

"More headroom so it will be easier to get in and out."—New Jersey assistant manager.

"Make cars smaller and pay more attention to craftsmanship instead of style."—Washington, D. C., owner.

"Leave off all chrome except bumpers and a small grille."—New York attorney.

"Make at least one very small, very low-price car to meet European competition."—Ohio newspaper executive.

More Best-Liked Features

Power and performance are fourth on the best-liked list, followed by interior room and that important, but hard to measure, "heavy, safe feeling" of the big, solid car.

"Great power controlled by a gentle touch. Smooth, silent performance."—Nevada housewife.

"I like its reserve power and pickup."—Oklahoma retail merchant.

"Roomy, comfortable on long trips. Other large cars do not give me legroom in front."—Ohio manufacturer.

"Very roomy. I need lots of room as I am 6 foot 3 inches tall, weigh 225 pounds."—Maryland executive.

"I like its weight and power for safety."—Kentucky insurance agent.

"Has a feeling of safety with its unit body."—New Jersey retired owner.

"I like the cutaway dash which allows plenty of front-seat room."—Connecticut factory superintendent.

(Continued to page 220)

For clean oil all the time
call for

 **HASTINGS**

Hastings Oil Filter Cartridges keep oil clean *all the time*, because only Hastings has Densite filtering material.

Densite is different! Millions of selected cotton fibres—pressure packed—trap even the most microscopic dirt particles. Only Densite keeps oil clean from filter change to filter change, when replaced as normally recommended.*

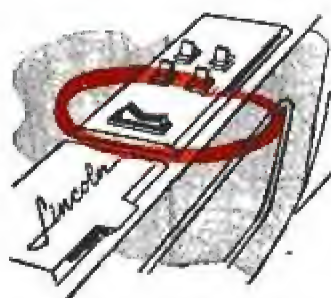
Next filter change, call for Hastings—for clean oil *all the time!* Hastings Manufacturing Co., Hastings, Mich. Also makers of Piston Rings, Casite, Wear Reducer, Spark Plugs.

**Proved by tests conducted in accordance with U.S. Bureau of Standards procedures.*



U. S. Patent
Nos. 2,797,811
2,584,771

Continental's rear vision is outstanding, especially on convertibles which are usually somewhat blind to rear. Back-slanted window lowers for ventilation. Some kind of rear vent is certainly coming for all cars.



LINCOLN'S SWITCH (IN CIRCLE) MAKES POWER-WINDOW CONTROLS ON REAR DOORS INOPERATIVE SO THE KIDS CAN'T PLAY WITH THEM

He's sensible. Why complain about \$50 a year more for gas when depreciation costs \$50 a week?

Additional comments: Front end shudders on washboard roads. Slight, but audible, rear-end whine at 50 m.p.h. Power steering periodically noisy. Transmission quadrant very hard to read. Test car was white, and glare from hood and fender sheet metal was almost overpowering in bright sun. Wipers very quiet and did the job well. Spare tire mounted far forward in trunk to give more storage room, but is hard to lift out if needed. Can't avoid feeling Lincoln would be a better car if just a few inches narrower and a few feet shorter.

"Comfortable seats. Good instruments."—Rhode Island orthodontist.

"Easy-to-read instruments."—Minnesota retired owner.

"Straight up-and-down rear window on Continental has perfect vision at all times. No snow or rain gets on it."—Maine doctor.

"Wonderful driving visibility."—New York businessman.

"Steering-wheel position very comfortable."—New York owner.

"Both factory and dealer gave me every consideration. The first car (it was recalled later) was one of the very first off the line and had no relationship to this present one except in looks."—Oregon physician.

"Best engineered car I have seen, but engineers should give more attention to maintenance."—New Jersey retired owner.

And More Complaints

Here, in order of frequency of mention, are quotations describing other complaints of owners. Most of these were mentioned by a comparatively few owners ranging from 7.3 percent down to 3.0 percent.

"Water leaks in rain around dash and left vent window. Foot release on parking brake does not work properly."—New Hampshire owner.

"Leaks occurred in the power-steering unit. Mechanic said it was improperly put together and has fixed it as a makeshift until he gets a replacement."—New Jersey owner.

"Lincoln's weakest point is very poor dealer service. If they expect to capture the fine-car market, they need some correction here."—Indiana manufacturer's representative.

"Factory service as to parts is ridiculous."—New York manufacturer.

"Paint does not have lustrous, quality appearance of Cadillac."—New Jersey executive.

"Repairs cost too much. Change transmission oil, adjust bands, repair antenna. Total labor time three hours. Labor was \$23, parts \$22.50 for tiny antenna motor. Outrageous."—Michigan manufacturer's agent.

"It's a gas hog, but we can afford it."—Illinois physician.

"This is a Continental model. It costs about \$8000 and has the same body as the regular Lincoln. If I had known this I wouldn't have bought it. I know it is going to have an awful depreciation. I will lose \$50 to \$60 a week in first year's depreciation."—New Jersey farmer.

"Too long and bulky in tight places."—Virginia owner.

"Clock does not keep time and is very difficult to read."—Oregon optometrist.

"Vibration in body has been helped by a vibration kit and new shocks which dealer installed."—North Carolina attorney.

"Glove compartment too small and cheaply constructed. Too much wind noise."—Illinois businessman.

"I'm never sure top will operate in this convertible. Should simplify it. Too many electric switches. It's like a pinball machine."—Florida restaurant owner.

"Ash trays located so driver must divert his attention when disposing of cigarettes. I've had two near-misses already."—New Jersey Air Force officer.

"Rear taillights in perfect line with Cadillac dagmars."—Pennsylvania contractor.

There you have it, the good and the bad about the 1958 Lincoln as seen through the eyes of the owners. For an analysis by an engineer, turn back to page 112.



MENDS MOST ANYTHING

"HOLDS LIKE IRON"

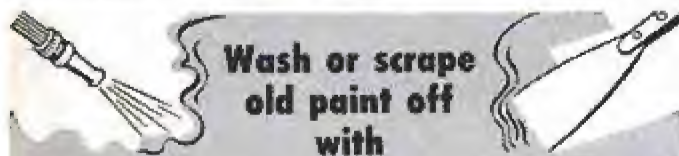
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Sands with or across grain without marking. Gets flush into corners. Two comfortable handles. Sands either wet or dry. Weighs only 2¼ lbs. **\$15.95**



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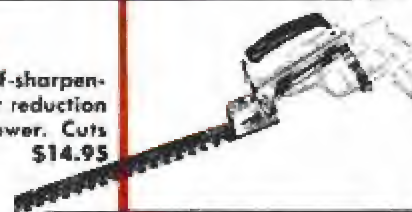
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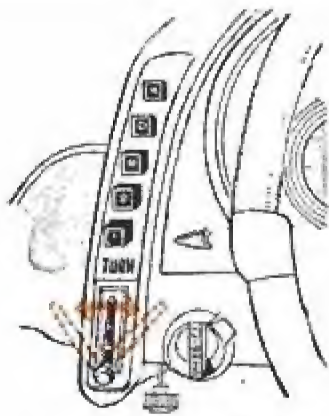
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Dept. PM-24

Greenfield, Mass.

SINCE
1868



IMPERIAL'S PUSH BUTTONS ARE VERTICAL. TURN-SIGNAL CONTROL AT BOTTOM IS NOT CONVENIENT

Tyranny of the stylist. Can't think of a single advantage to push buttons except styling. Instead of being easier than a lever, they are more awkward. Same for the turn-signal switch.

She brings up a good point. If you are wealthy you must buy a big car, even if you are small, live in a big city, with no children at home. You still must drive a big car. As watches get more expensive, they get smaller. Why not cars?

With eyes closed you know you're in luxury. You feel it in the fabric and the hardware. But the inside door handles are dangerous. With arm on door armrest, tendency is to hold onto the door handle. In an emergency, you might pull back, opening the door.

Imperial Owners Say Ease of Handling Is Tops

(Continued from page 115)

"Windows not properly supported on sides when part way up, causing rattles."—Pennsylvania retired owner.

"Something was wrong with the electrical system, resulting in a fire in the left rear door. Evidently it was in connection with electric door lock or window lift. Dealer was advised to change wiring."—Idaho executive.

"Finish on many plated and painted parts very poor. Rusted parts."—Wisconsin retired owner.

"I don't like push-button shift. Older system on steering wheel was easier to operate."—Ohio physician.

"Buttons are in a vertical row and Reverse is in the middle so you must look to make sure you don't push the wrong button."—California farmer.

"All controls are left handed and hard to reach."—New York builder.

"Don't care for directional-signal switch. Prefer it on the steering wheel. Also lights, heater, wiper switches all must be turned instead of pulled."—New York merchant.

Suggestions for Industry

Imperial owners have some suggestions for the auto industry as a whole that are of interest. These are not directed at Chrysler Corporation alone, but at all the American automotive manufacturers.

"Design and make cars first for dependability, ease of handling and comfortable riding. Add gadgets only after these fundamentals are assured."—Florida owner.

"Give more consideration to headroom and natural seating with higher seats."—Wisconsin executive.

"Cut down on length."—Washington, D. C., owner.

"Don't make cars any fancier."—Connecticut executive.

"Fewer sharp objects, inside and outside."—New York engineer.

"Industry is making a grave error in pushing larger and more powerful cars. This may seem a contradiction in view of the Imperial we own. However, I would be just as happy with a smaller, less powerful car if it held the road as well and was as comfortable to drive."—Illinois housewife.

"Most cars today look like back-alley modifications, adding wings here, gadgets there and a bunch of chrome strips."—Florida retired owner.

"Make a luxury car with all the comfort features, but smaller."—Maryland physician.

More Best-Liked Features

Here, in order of frequency of mention, are quotations by the owners describing more of the features they like most about their new Imperials:

"Well-built car with a luxurious interior."—Nebraska real-estate broker.

"I feel confident in it and relax in utmost luxury."—Illinois office worker.

"Has plenty of room without appearing bulky."—Florida sales manager.

"Terrific brakes. Very roomy for a convertible and smart looking, especially with the top down."—New York interior decorator.

"I like the six-way adjustable front seat. On a long trip I change my angle when I get tired."—New Jersey owner.

"Wonderful visibility. You don't feel like you're sitting

(Continued to page 224)

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DRAIN WASH TUBS, CELLARS, CISTERNS
IRRIGATE—FILL TANKS—DRAW WELL WATER

#7 Pump — 360 GPH, 1750 RPM.
¾" Inlet, ½" outlet, \$7.95 ppd.
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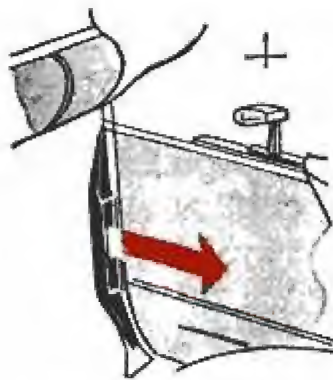
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IMPERIAL DOES NOT DUCT HEAT INTO REAR. HOT AIR COMES OUT OPENING UNDER DASHBOARD AND IS BLOWN BACK ALONG-SIDE DOOR

Who says Cadillac is the only prestige car?



The only cars that seem to think rear-seat riders get cold are Lincoln and Cadillac. Imperial still tries to warm the rear by blowing air from the front.



With any car that can't be parked in gear (and the Imperial can't) it would be safer to have a mistakeproof release for the parking brake.



More comments: It's a big car, but the driver isn't aware of it, so easy does it handle. Vision is excellent except for minor windshield reflections in sunshine. At night, black light illuminates dials eliminating glare and reflections. Rest of the dash (knobs and ash tray) is unlighted. Clock in direct line of driver's vision—now if it would just keep time. Center of front and rear seats useless on long trips due to lack of padding. Too much creep in transmission. Wiper action excellent except at end of stroke.

inside the car. You see all around."—California contractor.

"I like the electric door locks. Both doors on this two-door hardtop can be locked from either side."—Illinois lawyer.

"Has all the conveniences you can imagine. It has completely automatic door locks, windows, radio, antenna and seat for ease of driver."—Nebraska sales manager.

"I have driven 5300 miles to date and on long trips average 16.5 miles per gallon. Operating costs are very little more than for any of the three low-price cars, except for the tires."—Delaware executive.

"I like the visibility of the speedometer, various gauges and clock."—California retired owner.

"I like its bigness. I feel safer somehow. And the engine is so quiet that sometimes I think it's stalled. What could be better?"—Michigan housewife.

"I like the Imperial because the oil and gas expense is hardly greater than the low-price cars and I use the car to impress people in the real-estate market."—California real-estate broker.

More Complaints, Too

Here, in order of frequency of mention by the owners, are quotations describing additional complaints. These range in frequency from 4.7 percent down to 2.3 percent.

"The back deck of my car has been one continuous headache. It seems impossible to keep the trunk lid from popping up when I hit a good-size bump at a fair rate of speed."—Illinois sales manager.

"Transmission trouble. Howls."—Wisconsin supervisor.

"The hardest car to heat that I ever had. In fact, we have never had it warm."—California electrician.

"Floor mats not fitted as well as they could be."—Florida salesman.

"Power steering defective. Pulley sheared off while turning corner. Ash trays poorly planned."—Massachusetts attorney.

"Can't find ash tray at night because it is the darkest instrument panel I have ever seen."—Maryland executive.

"Poor placement of parking-brake release. It could be mistaken for light switch right next to it which would be disastrous if parked on a steep hill at night. You get out of car, notice lights are still on, reach in to put out lights and accidentally release brake!"—California securities trader.

"Places where doors join in four-door models are wide open and ugly."—New Jersey salesman.

"Water stays on top of the dummy spare tire on the trunk lid and I'm afraid it may cause rust."—New Jersey owner.

"There is no parking gear and my car is forever sliding down a hill when the emergency brake isn't on tight enough."—California executive.

"Bad door hardware."—Illinois banker.

"I am inclined to think that the designer must ride a bicycle as anyone who has driven the car could surely have found out that the defroster will not keep steam and frost off the windshield and that the driver can't reach the ash tray and cigarette lighter and that you can't put on the turn signal as easily as you should be able to."—Nebraska live-stock broker.

"Back doors on this four-door hardtop open too hard."—Wisconsin realtor.

That is what the owners of the Imperial like and don't like about their cars. For an analysis by an automotive engineer, turn to Dale Kelly's report on page 114.

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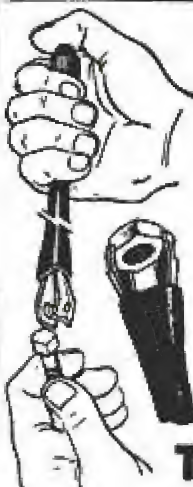
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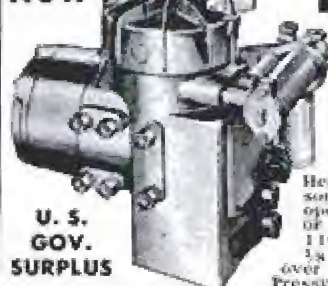
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Cadillac Owners Rate Riding Comfort First

(Continued from page 117)

Most cars have gone to a foot-operated parking brake. Now comes the foot-operated release. It's just another skill to be learned and it's hard to see the advantage.



CADILLAC MOUNTS ITS BATTERY IN FRONT FENDER BEHIND HEADLIGHTS—A VULNERABLE SPOT

When Cadillac owners talk like this, it is time for Detroit to get on with it!

Cadillac (nor the other two for that matter) is no car for the dragstrip. But it gets away quickly and without jerking your head back uncomfortably. You feel the power, but it doesn't kick you in the pants.

It feels so heavy that its inertia is a bit frightening. There seem to be tons in motion. Braking requires an unusual amount of pedal pressure even with power assistance.

Fourth on the complaint list is engine noise, although it is mentioned by only 3.6 percent. The same number complain about brake trouble, principally with the parking brake. Other complaints involve mirror location and poor acceleration. Here, in order of frequency of mention, are these additional owners' complaints:

→ "Excessive roar in exhaust system at high speeds and when taking off."—Iowa dairy farmer.

→ "Engine too noisy. Suspect it is because r.p.m. is away up. Noise commences at 60 miles per hour. Sounds like a truck going by in 7th gear."—California owner.

→ "Poorly placed parking-brake release. Could be operated more efficiently by hand knob on dash."—Maine general contractor.

→ "Brakes require 1000-mile attention. Won't release. Engine must be tuned every 1500 miles."—Tennessee owner.

→ "My only complaint is that the rear-view mirror is too low. It makes a blind spot which is very hazardous."—Wyoming retired owner.

Suggestions to Industry

Cadillac owners offer some interesting answers when asked to make one suggestion to the entire automobile industry (not just to Cadillac):

→ "Don't go any lower to satisfy styling at the expense of seating position."—Michigan engineer.

→ "Make it look like an automobile again."—New Jersey funeral director.

→ "Don't make the cars any longer or wider."—Pennsylvania bakery owner.

→ "Cut back on horsepower to increase gas mileage."—Minnesota businessman.

→ "Make more distinction between different cars."—Texas funeral director.

→ "Build a quality American car. I saw some foreign makes that seemed better built."—Pennsylvania salesman.

→ "Get off the emphasis on tails."—New Mexico engineer.

→ "For higher-price models, stop changing to cheaper styling."—Florida school principal.

→ "The industry tries to create a car 'out of this world' to beat its competitor, rather than to create the kind of car the average motorist really wants. The extreme fins, the wrap-around windshields, increase the cost of the car and are not what the public really wants. The average American businessman would prefer a car on the conservative side."—Kentucky contractor.

More Best-Liked Features

Fourth on the best-liked list is power and performance, followed by that heavy, safe feeling of the big car. After these come roadability, quiet operation, prestige and others described in the following quotations (given in order of frequency of mention):

→ "Engine seems to respond promptly when power is needed."—Pennsylvania salesman.

→ "I like the safety factor of a heavy, well constructed car. Also it gives me prestige away from home."—California real-estate investor.

→ "It has a solid feeling. It's the safest feeling car on the road I have driven."—Oregon contractor.

(Continued to page 228)

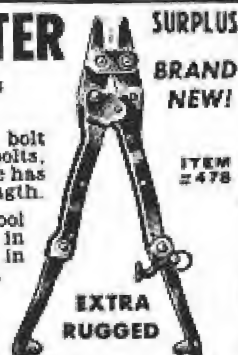
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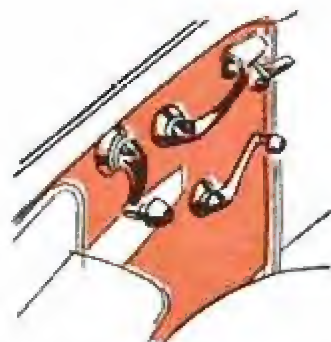
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Balance is something you can't measure — you have to feel it. Railton ranks Imperial best in this department. You should drive all three and make your own judgment. →

There's no sin in buying a car to build up your ego. The error comes when you buy it for this reason, but justify it on other grounds. →

He must have latched onto a live one! →



CADILLAC'S FRONT DOOR HAS A CLUTTER OF HANDLES, NOT ALL OF WHICH ARE WELL POSITIONED

Added comments: Seats of excellent height and comfortable. Very good speedometer dial. Vent and heat controls simple and convenient. Ash trays handy, lighter location not. Steering not so precise as in the other two cars, seems to have less road sense too. Front end shakes on washboard. Ride too soft on undulating roads. Fuel-gauge needle a masterpiece of uncertainty. A huge dot on end of needle covers almost a quarter of the scale. Heater blower runs all time heat is needed. Extreme display of chrome on dashboard seems out of place in a top-drawer car. Some windshield reflections at night. Vacuum wipers slow down on acceleration, just when most needed. High-beam indicator lamp almost invisible, as are the hands of the clock.

"Well balanced. Hugs road on curves."—North Carolina executive.

"I like its absolute quietness on the road."—California retired owner.

"The name 'Cadillac' has the sound and feel of prestige due to good propaganda advertising."—Pennsylvania owner.

"Cadillac prestige."—Texas investment executive (and to prove he's most interested in prestige, he adds a complaint that there is "not sufficient identification of Cadillac on the side of the car").

"The Cadillac is not as good as the reputation it has. It is better than most cars, but you pay for this in a number of ways. I would say that the best thing about a Cadillac is that it builds up one's ego."—Louisiana sales engineer.

"Dollar for dollar, the least expensive car to own."—Arizona sales engineer.

"I find now that I can trade Cadillac for a Cadillac about as cheap or cheaper than when I drove a new Dodge or new Buicks. My 1955 Cadillac I sold outright for cash within \$950 of what I paid new at end of one year."—Michigan real estate dealer.

"Gives a durability that I have been unable to get in any other car."—Wisconsin real estate man.

"Starts good in cold weather."—Idaho farmer.

"The car has a nice view from every seat inside. Instrument panel is excellent with everything at your fingertips. The car is built solid."—Illinois motel manager.

And the Other Complaints

Mentioned by a small percentage of the total, but still by enough to be of interest are the following:

"Too much slippage in Low. Motor races and car barely moves off. Pickup speed too slow. Dangerous in heavy traffic."—Oklahoma owner.

"There is something wrong with the transmission, I think. A heavy noise that we don't like and the garage can't detect the trouble. We have been waiting two months to get it fixed, if and when a factory representative gets here."—Illinois decorator.

"Body slightly too long."—North Carolina surgeon.

"Nice car, but price much too high. Everything but the four wheels, body and steering wheel is extra cost."—Washington, D.C., executive.

"Rear springs are too soft. Car sags in the rear with very little luggage in trunk."—Ohio businessman.

"Poor paint job. Many spots are bare where body panels meet."—New Jersey housewife.

"Front grille is a car-washer's nightmare."—Ohio mechanical engineer.

"Dust fogs in the trunk and back seat when driving on country roads."—Colorado farmer.

"Window cranks are in awkward position. Difficult to use."—New Jersey executive.

"Door opener is hard to reach. Foot parking brake hard to release. I prefer a hand release."—Connecticut physician.

"Hands on the clock and the pointer on the gas gauge have little white dots on them and are very hard to read."—Texas housewife.

"I certainly don't like that 'seven minute warmup' racing period to warm up the engine in cold weather."—Illinois publisher.

That is the story of the 1955 Cadillac as told by the owners themselves—owners from all over the country who know the car best. For an engineer's report turn to page 116.

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Rated 300 Amps, 24-32 Volts. Complete Kit consisting of 300 AMP Gen., 1 Voltmeter, Ammeter, Voltage Regulator, Rheostat Control, Giant Toggle Switch, Electrode Holder, 30' heavy duty welding cable, Welder's Helmet, wiring diagram. Approx. GOVT. COST \$450. Kit complete \$37.50.

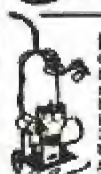


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ARC WELDER KIT—\$26.00 Build your own complete make-up package incl. 1 Aircraft DC Gen. 200 Amps, 24 V. Rheostat, Toggle Switch, 1 Ammeter, Electrode Holder, Welder's Shield, 30' New Welding Cable, Voltage Reg. Simple instruction wiring diagram. Wt. under 100 lbs. Approx. GOVT. COST \$475. All units guaranteed pre-tested. \$26.00.



WELDING CABLE DOUBLE-O, heavy duty, neoprene jacket, Fiberglass insulation. NEW. Approx. GOVT. COST \$40. 50' lengths. Will handle 400 Amps. or better. \$14.50.



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Great for tree, termite, airbrush & paint spraying; filling tires, aquariums, etc. Dual & remote control electric receptacles, 115v 60 cycle AC, heavy duty HP. Westinghouse Motor. Direct drive. Water & explosion-proof. Built-in air filter, adjustable pressure setting up to 47 lbs. 3 cu. ft. per min. Self-contained switch. Mounting brackets. These units made under license of Sperry Gyroscope Co. Wt. 66 lbs. gross. Approx. GOVT. COST \$385. Like NEW. \$23.95.

With portable steel hand cart (shown), rubber wheels, specially constructed for mounting this unit. Incl. 25' rubber air hose. 6' extension cord with plug & fittings. Wt. 76 lbs. Complete with cart—\$26.95.
With new internal-pressure spray gun with 3 adjustable spray tips. 1 qt. cap. \$39.95 complete.

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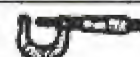
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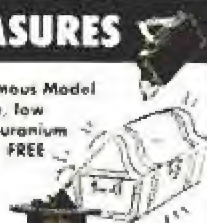
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An Editor Reports From Canaveral

(Continued from page 64)

froze it solid and then hit it with a hammer. The snake crumbled to powder.

There's a popular misconception that at the dramatic "zero" second of countdown, the launching officer presses a red button—and away she goes. Actually, that "red button" is not a button, but a locked mechanism that can't be pushed or "sat on" by accident. And it isn't triggered at "zero." The switch is thrown 15 or 20 minutes before T-time. From that point on, electronic impulses humming through the "umbilical cord" attached to the bird's electronic brain start an automatic sequence of launching preparations. Valves open or close, ports secure themselves, pumps work liquid fuels and gases to proper pressure. If anything goes wrong, blockhouse control can stop the sequence up to the instant of take-off. But if all goes well, the rocket itself fires its own preigniter and first-stage propellant.

Central Control Takes Over

Once the missile is off the ground, control shifts from the blockhouse to a four-story building well back from the sea. This is Central Control. The men here have been busy for 150 hours before countdown, clearing the range of ships, planes and radio interference. Crash boats from Port Canaveral clear inshore waters of fishing craft. In the early days at Canaveral, ships were warned out of the danger area by small planes that flew low over their masts while the pilot leaned out and shouted through a megaphone. Today jets scream far down the range corridor, alerting all ships and commercial planes by radio.

Though called a "ballistic missile," even Atlas does not follow a completely unguided flight like the free-soaring trajectory of an artillery shell. Inside its skin, inertial-guidance systems constantly nose it along a predetermined route. Radio command from Central Control can make it change its mind. In emergencies, the safety officer can punch the "destruct" button, blowing up the missile in midflight. At power cutoff, some 200 miles above the earth, the Atlas *does* soar ballistically in free flight to its highest point, about 600 miles in space. Its warhead detaches and falls ballistically to target, though rumor around the pads has it that some ground-radio control over rockets in the nose cone can alter the course somewhat.

There's one man in Central Control who can tell you at any instant of a missile's flight just where it will fall. In front of him is a backlighted map of the range, across

which a thin line is moving. This doesn't represent the missile. The stylus is actually on the point that the missile will strike if it loses power and soars in free flight from where it is at that instant. This is the "impact predictor"—one of Canaveral's newest miracles.

To produce that prophetic line, an array of electronic gear, known as the "Azusa Complex," sprawls across several acres of sand. Azusa, designed by RCA engineers, consists of eight antennas laid out on the sand like the spokes of a gigantic wheel. Tracking the missile as it goes, they transmit signals to the flying rocket. Inside the missile the signal is digested and a new signal is shot back to Azusa's ground receiver. Here, the rocket's answering signals are instantly fed to a big computer. Every quarter of a second the electronic brain calculates from these signals the exact position of the soaring missile, remembers all the previous positions, determines the missile's velocity, course and trajectory, and calculates where it would fall if power cutoff occurred at that instant. These answers are fed to the electronic pens that creep faster and faster across the display screen in Central Control. If the impact point veers across either of the two "destruct lines," the safety officer will destroy the rocket.

Development work never stops at Canaveral. Right now, men are working on a tremendous hole in the dunes. This will house a massive steel platform capable of rolling and pitching in any direction. It will be a swaying launch bed, designed to simulate the deck of a ship at sea—for the test shots of the Navy's new Polaris missile.

★ ★ ★

Do You Know This Old-Timer?

(Answer to quiz, page 12)



1916 Dodge 4-Cylinder

(with modifications)

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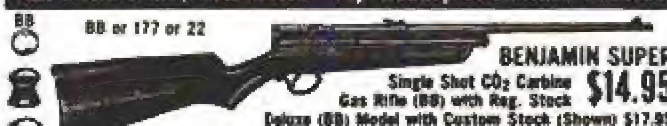


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References: Dun & Bradstreet, Inc., Charleston, W. Va. and The Lincoln National Bank, Hamlin, W. Va.

Meet Lithium—

(Continued from page 61)

plenty to go 'round. North America is believed to rank first. Canada has vast deposits and there's a "mountain of lithium" at King's Mountain, N. C. Africa probably ranks second, with a huge deposit at Bikita, Southern Rhodesia, generally conceded to be one of the world's outstanding deposits. There also seems to be plenty of lithium-bearing ore in South America, Europe, Australia and Asia.

Wresting the lithium from the rock is not an easy job, and techniques vary somewhat. In one process, the ore is ground into fine sand and, through froth flotation, the lithium-rich particles are separated out. This material, about six percent lithium oxide, is mixed with limestone, and the mixture heated in a huge rotary kiln. The heat sets free lithium and potassium salts. From the resulting solution, lithium hydroxide is recovered by concentration and evaporation. In this process, lithium hydroxide is the end product which is shipped to the AEC.

It's a long road. About 230 pounds of raw ore must be processed to obtain a single pound of lithium, and of this pound only about 1½ ounces are Li-6, the real goal of the AEC.

Several projects are under way in this country — and presumably in others — for harnessing the energy of the hydrogen (fusion) bomb. It's barely possible that uranium (fission) reactors will be old hat before they ever come into style. If so, that dapper gentleman called lithium probably will be dictating the trend. No crystal ball is needed to foresee at least the possibility of a lithium-hydrogen age taking over before the age of the atom even gets a headlong start. ★ ★ ★

Intense Radiation Blankets Earth

There is a mysterious blanket of radiation more than 660 miles above the earth's surface. So intense is this radiation that, within five hours, a human would be exposed to the highest permissible radiation dose for a week. A report on the radiation recently was released along with other findings from the first two U. S. satellites. The radiation is so powerful that Geiger counters on the satellites "blanked out" from the overload. Though the intensity of this radiation was not previously suspected, it probably will not deny space travel to man. Dr. James A. Van Allen of the State University of Iowa, has calculated that a lead shield one millimeter thick would lengthen the safe exposure period.

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CHAIR—complete with cushions and covers \$32.50

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688
30" x 72"

Special IMPORT BARGAIN! Just in time for your camping season. Made of heavy duty rubberized fabric for puncture resistant comfort. Size: 30" wide x 72" long. Ideal for use in sleeping bags.

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CHOICE OF 4x-6x

An ideal scope for Target, Bench Rest or Small Game. Has direct reading windage and elevation knobs. Lenses are hard coated on all air-to-glass surfaces. Eye relief—2-1/2" to 4-1/4". Has a sharp, clear cross-hair reticle. Focus is lock-tight—won't shoot off. Barrel is rust-proof steel. FREE rifle mount with each scope. Specify make & model rifle.

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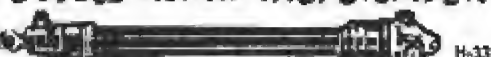
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No priming—uses no cartridges—self-generating on regular gasoline. All brass. Weighs only 12 lbs.

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Blades are heavy duty stainless steel made to fold easily into the handle of each. Consists of a knife with sharp edge, a three tined fork and a spoon. In plastic carrying case.

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9 practical tools in one: Jack-knife, saw, scissors, can opener, Phillips head screwdriver,awl, large knife, bottle opener and a standard screwdriver. Rugged steel blades. Easy-to-open

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NEW BOX SPOTTING TELESCOPE

Now Palley Import! Ideal for spotting hits on rifle range or for spotting "SPUTNIKS". Has high luminosity 40 power eye piece with 60mm coated objective lens. Comes with sturdy metal tripod. SAVE NOW!

3x TANK TELESCOPE

Made of brass & steel. Contains a Kellner eyepiece, reticle, 2 achromatic eyepiece lenses, 1 achromatic objective lens (25 mm diam.) with all optics coated. Lgh. 22 1/2". Field 12° 19'. REG. 3x **4.88**

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WORLD WIDE RADIO—ANYTIME—ANYWHERE:

Hear England, France, Germany, Spain, Italy, Russia, Africa, Australia, South America—ANYWHERE IN THE WORLD! Gets ALL foreign radio stations! Not much larger than a postcard. Wt. only 2 lbs. Complete with pull out antenna and standard low cost flashlight batteries—NO AC PLUG-INS NEEDED! EVER! Gets American broadcast bands—550 kc to 42 megacycles—continuous on 6-1 radio tuning dial. Radio Amateur bands 160-80-40-20-15-10, Ships, Aircraft, Air Force, 2-way Mobile, Police—Citizens Bands! THERE IS NOTHING LIKE THIS MIDGET ALL-WAY RADIO ANYWHERE ELSE! AT ANY PRICE! Wonderful for tourists, Boy Scouts, Radio Amateurs—ANYONE! YOU CAN HEAR THE WHOLE WORLD DAY OR NIGHT—EVEN "SPUTNIKS"!

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Take this lightweight 110 V. 60 cycle AC generator anywhere for full 750 watts of light and power. Small, compact, completely self-contained. Weighs only 49 lbs. 2 HP engine runs up to 3 hours on single tank-full. Rewind starter; built-in muffler. Mail coupon now.



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Powerful 5-HP Gravely. America's most versatile small tractor, does every lawn, garden and field job faster, easier, better!

Choice of 30 performance-proved tools. All-Gear Drive, Power Reverse, Push-Button Starter optional.



New 24-page "Power vs Drudgery" Booklet shows how Gravely power and performance can solve YOUR problems. Write for it today!

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Countdown!

(Continued from page 69)

Seven hundred and fifty feet away rocket engines developing hundreds of thousands of pounds of thrust have roared into life, belching great streams of flame.

But the engine roar does not penetrate the thick walls of the blockhouse. Here all is quiet as each man intently watches his dials and recordings. In case of a malfunction the test still can be stopped. The sequencer is timed to hold the missile on the pad for 10 seconds before releasing it, to give the crew time to make sure everything is operating.

The seconds slip past. The count over the communication system has halted, but each man counts to himself.

"Seven, eight, nine, ten."

Then comes the word from the periscope observers:

"First movement."

The arms holding the missile on the launching pad fly back.

"Liftoff."

Eyes turn from panels to TV monitors.

Going, Going, Gone

The test conductor stands to get a better view as the missile rises slowly, its tail of flame and smoke beating down on the launching pad.

"Go, baby, go," he says in a low, tense voice.

The missile goes straight up without a waver. It is accelerating rapidly. The flames no longer beat on the pad.

"Go, baby, go," louder this time.

Now the missile begins to pitch over from its vertical flight to take the proper angle for its trip down the firing range.

The test conductor is pounding his desk with his fist. His voice has risen to a shout:

"Go, baby, go."

★ ★ ★

Plastics Withstand Extreme Heat

Thanks to a new family of plastics, many of the atmospheric heat problems of rockets may be solved effectively. The plastics, called Havg compounds, are unique in that they are formed like plastics, have the strength of metals and the heat resistance of ceramics. When they are subjected to temperatures as high as 12,000 degrees F., a chemical reaction takes place, producing an entirely new material that reflects most of the heat.

☐ Bagasse, the fiberlike residue that remains when sugar is extracted from cane, has been made into heavy corrugated-paper shipping boxes.

AMERICA'S BEST

1500 WATT PLANT
115v. 60 cyc. AC Push Button Start. Powered by a 3.6 HP. Clinton engine. Combines big output with easy portability. Provides emergency power for operating any oil burner, sump pump, freezer, television, lights, communications systems, etc. which require up to 1500 watts. (Item 22). Wt. 110 lbs. Reg. \$475 value. Factory price... **\$239.50**
1750 Watt Plant Powered by 4.5 Briggs engine. Electric starting & battery charging built-in! Factory price... **\$279.50**
2500 WATT PLANT—Push Button Start (Item 21) 110/120 v. 60 cyc. A.C. A rugged powerful plant. Reg. \$645. Spec. **\$329.50**
4000 Watt Plant Push Button Start (Item 23) 115 v. 60 cyc. A.C. Similar to above, but larger and 33% more capacity. Wt. 270 lbs. Reg. \$760. Factory Price... **\$379.50**
DUAL VOLTAGE 110/220 for item 21 or 23 —\$30 additional.

ELECTRIC HOIST

2000 lb. CAPACITY. A fortunate purchase from the Air Force enables us to offer these powerful 2000 lb. electric cable hoists at a fraction of their value. Perfect for material handling, boat hoists, elevators, lifts on assembly lines, etc. Two separate 22 ft. lift cables with independent controls permit leveling the load and controlling it perfectly. Rugged ball bearing motors of geared down design 110 volts. Available for A.C. or D.C. Please specify. Makes a terrific portable hoist with our 2273 D.C. light plant at \$69.75. Offered at less than 33% of regular cost (hook not included). Wt. 145 lbs. A.C. Model, item 847A... **\$149.50**
D.C. Model, item 847... **\$129.50**

MASTER AIR COMPRESSOR
COMPARE! This is the only compressor built with a NO RUST stainless steel tank. Safe up to 500 lbs. (item 209) High pressure type (4 c.f.m.) Large volume of air for heavy duty service. For paint spraying, inflating truck & auto tires, greasing, sand blasting, etc. Platon type 2" bore compressor with built-in air filter. Master built with high strength alloys and precision bearings. Tank, 12"x24", 2100 cu. in. cap. Equipped with automatic switch that starts and stops motor to maintain desired pressure (up to 120 lbs.) and check valve, safety valve, gauge, shut-off valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Don't take chances with used or surplus equipment. Our compressors are factory new and are guaranteed SAFE. 1/2 H.P. heavy duty model, reg. ind. motor and unloader switch... **\$129.50**
Item 209A, low factory price... **\$109.50**
1/2 H.P. model, Cap. 3 c.f.m.—**\$89.50**, item 200

JET STEAM MASTER
Now, a super efficient portable steam generator that produces live steam at 100 lbs. pressure in 60 seconds from a cold start! Produces large volume of high pressure steam on 2 pints of fuel oil. Instantly cleans sticky grease, dirt, rust, old paint, etc. off implements and road machinery. Pays for itself in a few weeks. Sterilizes soil. Sterilizes as it cleans—milk equipment, etc. Fully automatic—oil fired with new, built-in lifetime bronze water circulating pump. Draws water from faucet or bucket. Simple and safe—anyone can use it! Built-in safety valve. Complete with 12 ft. of idiosyncrasy steam hose and new triple efficiency steam gun that automatically mixes in soap solution if desired. Wt. 250 lbs. Item 463. Special factory price... **\$349.50**

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(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range removes kitchen smoke and odors. Powerful, continuous duty motor. 110-120v. A.C. Mount in wall or ceiling to ventilate any area. Quiet, super-efficient fan moves huge volume of air. (400 to 600 CFM.)
8" Pipe, wt. 5 lb... **\$6.85**
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10" Pipe, wt. 7 lb... **\$8.85**
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**700 WATTS
PUSH BUTTON START**
115 v. 60 cyc. AC Powered by a rugged 2.2 HP easy starting Briggs engine. No wiring necessary; just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc., which require up to 700 watts. Ideal for television and radios. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. (Item 24). Wt. 75 lbs. Easily fits in car trunk. He prepared if storm knocks out power lines. Reg. \$275 value... **\$143.50**
1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine **\$199.50** with 50% greater output.

Double Acting Hydraulic Cylinder

A powerful cylinder mfr'd. by Massey Harris which develops both a pushing and a pulling action. Will push 8,100 lbs., with a 1000 PSI pump pressure. Cylinder is 3 3/4" O.D. with 3 1/2" stroke—standard heavy duty clevises on both ends. Has standard 1/2" pipe thread openings. Can be used for tilting buckets or blades, raising or lowering implements, hydraulic presses, etc. Can also be used as an air cylinder. (Item 802) Wt. 17 lbs. Reg. \$68 value. Special... **\$14.95**

OTHER DOUBLE ACTING CYLINDERS
6" stroke — 1 1/4" bore... **\$ 8.95**
8" stroke — 3" bore... **34.00**
10" stroke — 3" bore... **34.80**
14" stroke — 3" bore... **43.00**
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42" stroke — 5" bore... **75.00**
60" stroke — 5" bore... **125.00**
We have all sizes of cylinders available.

HYDRAULIC CONTROL VALVE — 4 way open center valve with built-in adjustable relief. Controls 1 double, or 2 single acting cylinders. Equalizing feature permits easy control even under heavy loads. 3/4" pipe thread on inlet & outlet. 1/2" on cylinder outlets. Easily mounted, finger tip control. Wt. 16 lbs. (Item 822)... **\$21.95**

HYDRAULIC KIT

Complete Hydraulic Kit consists of hydraulic hand pump with built-in 2 gal. reservoir and Item 802 hydraulic cylinder described above. Pump has a built in relief valve and is rated at 10 tons. Kit is ideal for presses, jacks, snow-plows, etc. Pump is 29" long—6" diam. with 3/4" ports. A terrific value! (Item 836). Wt. 50 lbs... **\$39.50**
Pump only (Item 836a) only... **\$23.50**
HYDRAULIC HOSE COUPLERS Connect or disconnect hydraulic lines without loss of oil. 1/2" pipe threads. (Item 819) per set **\$3.95**

GIANT METAL SHEARS

Nine inch cutting blade made of special high carbon alloy steel, perfectly aligned and ground. Easily cuts steel plate up to 12 gauge or 1/4" thick. Overall length 40". Wt. 23 lbs. (Item 156) Regular **\$49.50**. While they last... **\$14.95**

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SAME HAMMER, WITHOUT ARM
Originally designed to hammer dents out of auto bodies, fenders, etc. Complete with 2 different shaped arms, a set of 5 bumping dollies, and 20 ft. of heavy duty air hose. Hammer can also be used without arm. Uses 4 CFM at 60-100 PSI. **ORIGINAL COST \$175.00 SPECIAL \$39.50**

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Never before available! Now offered exclusively by Master Mechanic. A low priced, lightweight, continuous duty Diesel generator set. Powered by a super rugged, exceptionally smooth running, one cylinder Diesel engine. Operates at conservative 1750 r.p.m. and delivers full 1750-2000 watts of power. Operates on low cost fuel oil. Wt. only 240 lbs., representing a triumph of Diesel Engineering. Complete with fuel filter, oil pressure gauge, control box with duplex receptacle and voltmeter. (Item 830) Special factory price... **\$429.50**

HI-FLO Centrifugal PUMP

Completely self-priming! No foot valve required. Tremendous capacity—100 gal. per min. Special impeller enables pump to handle muddy or sandy water. Simple to operate—simply start engine and watch the water go. Powered by a rugged, easy-starting 2 HP Briggs engine. Pre-lubricated sealed bearings for years of heavy low-cost service. Big 1 1/2" Model, Item 502. Wt. 70 lbs. Factory Price... **\$134.50**
2" Model (150 gal. per min.) with 3.6 hp engine. Item 502B—90 lbs. Special... **\$169.50**

RUBBER HOSE

Genuine Neoprene Hose — outlasts ordinary rubber 3 to 1. Reinforced with super tough cotton cord plies—yet completely flexible. Equipped with standard thread male and female fittings. Pump water for irrigation, stock tanks, home, barn fire fighting, etc.—or pump gas and fuel oil. Volume factory prices—save more than 60%.

Size	Price	Size	Price
1"x10'	5.95	1 1/2"x50'	29.50
1 1/4"x10'	7.95	2"x10'	16.50
1 1/2"x20'	10.95	2"x10'	9.50*
1 3/4"x25'	13.95	2"x14'	21.50
1 3/4"x30'	24.95	2"x50'	47.50
1 3/4"x100'	49.95	2 1/2"x10'	21.75*
1 3/4"x10'	10.95	2 1/2"x15'	25.00
1 3/4"x25'	14.75	3"x10'	25.50*
*Discharge Hose		4"x15'	44.95

NEW ITEMS: (Too late to illustrate)
1. **MINE DETECTORS:** Used by plumbers, contractors, water dept. etc. for detecting buried metallic or non-metallic objects. Finds buried sewers, water pipes, wires, etc. Complete in carrying case. Batteries \$10.00 extra. Gov't Cost \$800. Our price... **\$39.50**

MASTER D.C. ARC WELDER

Easy To Use
Now! a portable rugged, industrial type welder with terrific performance, yet at a price hundreds of dollars less than you'd expect. Senior model made for years of trouble-free, continuous service. High capacity DC welding unit enables you to tackle any job with confidence—easily welds anything up to 2" plate using from 1/16" to 1/4" rods. Built-in stabilizer and cooling system makes arc easy to strike and hold. Dual control rheostat provides low heat soldering, brazing and welding from 30 to 300 amps. Complete with instructions, guarantee and triple V-belt or flat pulley. Easy to hook up and easy to operate. **WELDER ONLY — DUAL CONTROL MODEL.** Same as above, but drive with your tractor, jeep or gas engine of 14 HP or more. (Item 38a). Wt. 110 lbs. \$450 value **\$119.50**
WELDER ONLY—INDUSTRIAL MODEL same as above but with ceramic rotary type rheostat providing 74 different heat settings for all types of welding (Item 38b) \$500.00 value... **\$139.50**
COMPLETE POWER MASTER (illustrated above) powered by a 18 hp., air cooled Wisconsin engine. Wt. 460 lbs. (Item 280) Compares with welder costing \$1200. **\$449.50** Factory Special.

WELDING KIT Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at... **\$10.50**

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to make **BIG MONEY**



BY 35

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The third is a sample lesson in Basic Mathematics which demonstrates how easily yet how thoroughly I.C.S. helps you master a subject.

WE'RE willing to wager that, given the proper guidance and training, you can at least double your present income within the next few years.

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One is the gold-mine of helpful career tips, "How to Succeed."

These books will be especially useful to you if you are between 20 and 35—provided you want to enjoy the rewards of success before you reach middle age. Actually, the famous I.C.S. method of "Success Conditioning" knows no age limit. It's never too late to learn.

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